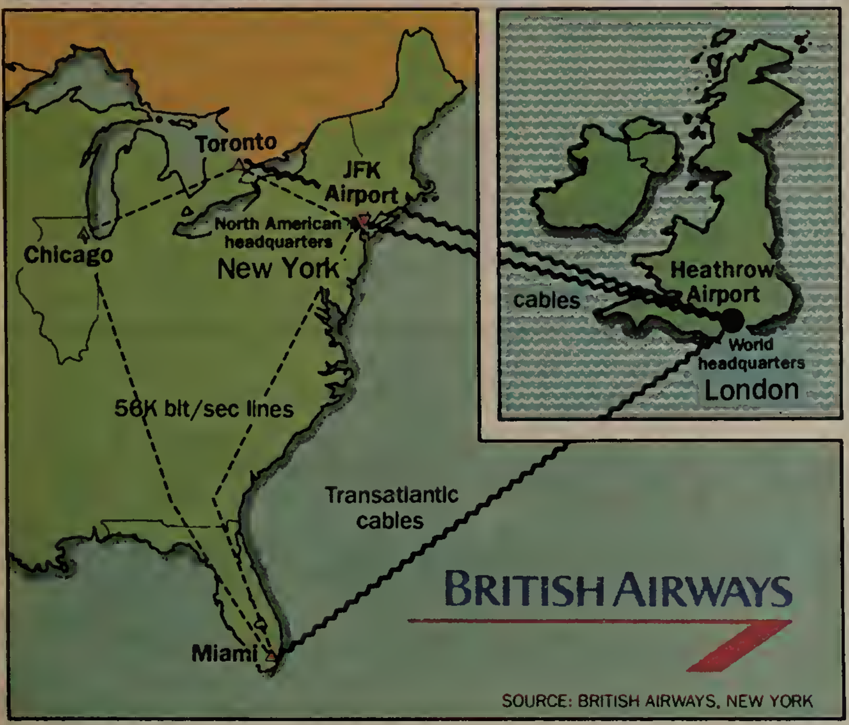
NETWORK WORLD

THE WEEKLY FOR LEADING USERS OF COMMUNICATIONS PRODUCTS & SERVICES VOLUME 3, NUMBER 27 SEPTEMBER 8, 1986

British Airways planned communications network



SOURCE: BRITISH AIRWAYS, NEW YORK

▶ NET OVERHAUL

New British Air net taxis to takeoff

BY BOB WALLACE
Senior Writer

NEW YORK — British Airways has embarked on an ambitious $70 million project designed to decentralize the airline's North American communications network and distribute control of the mammoth net among offices in five cities on the continent.

The company will construct its new five-hub communications network from scratch and expects it to be completed by March 1, 1987. British Airways' North American headquarters, currently located here in Manhattan, will be shifted to a building outside the borough.

See **British** page 6

▶ INTEGRATED NETWORKS

DEC ushers IBM PC into its net world

Product troika puts Big Blue on DECnet.

BY PAUL KORZENIOWSKI
Senior Editor

MERRIMACK, N.H. — More than five years after IBM introduced its Personal Computer, Digital Equipment Corp. last week acquiesced to the IBM product's industry stranglehold by introducing three technically elegant products that tie Personal Computers into DEC networks.

Although the products have some limitations, observers agreed they represent another step toward true integration, wherein users will easily be able to access and work with data residing anywhere on a companywide backbone network.

"I think the DEC offerings will give the company a leg up on competitors like Data General [Corp.] and IBM," noted Walter Ulrich, a partner with Coopers and Lybrand in Houston.

Among the products was VAX/VMS Services, a software product that enables a DECnet network to support application programs written for Microsoft, Inc.'s MS-DOS 3.1 operating system.

Another product, VAXmate, is an IBM Personal Computer clone able to run programs written for a VAX. The third prod-

See **DEC** page 8

▶ TELECOM TRENDS

Users gobble up used gear

Tax changes, AT&T blessing prime resale pump.

BY MICHAEL FAHEY
Staff Writer

There may be used telecommunications equipment in your future.

The used equipment market is heating up, owing to major changes in U.S. tax laws, AT&T's support and a growing inventory of reliable second-hand gear.

"Numbers are hard to come by, but there's no question the market for used equipment is hot," said Heidi Vogt, telecommunications analyst at Arthur D. Little, Inc., a Cambridge, Mass.-based consulting company.

Vogt said one of the most important factors behind growth in the used equipment mart is an AT&T program originally instituted in 1983. Through the program, AT&T

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NETWORK LINE

News

Pacific Bell dubs the beta test of its Project Victoria a royal success. The trial of the ISDN-like service came to a close last week. Page 2.

▼

Even the charm of old Philly probably won't attract the anticipated hordes to NCC Telecommunications '86. With the show slated to begin today, the roster of exhibitors and attendees looks a bit skimpy. Page 2.

▼

IBM and Industrial Networking spread out their MAP products at the International Machine Tool Show. The pair's MAP product introductions will add more pep to the push for user acceptance of advanced factory networking technology. Page 3.

▼

Vendors know users are eagerly awaiting support of IBM's LU 6.2. But that support doesn't necessarily have to come forth immediately. Page 3.

▼

The Department of Defense weaves a wide network of data bases called Computer Aided Logistics Support, or Cals, which is aimed at smoothing its logistics systems. Page 4.

▼

Features

Imagine a single cabling system that transfers all electrical power, data, voice and video through one universal interface. Smart House Venture, backed by some of the largest U.S. corporations, is working to do just that. Page 35.

NEWSPAPER

FEATURE FOCUS

A harmonious musical interface

Instrument connectivity is music to composers' ears.

BY STEVE CUNNINGHAM
Special to Network World

Nowadays, any type of analog information can be transformed into data by digitizing it: voice, text, graphics, video — even music. The musical instrument digital interface (Midi) is a big hit in the entertainment industry, providing commercial recording studios, video postproduction houses and even amateur musicians with a means of integrating synthesizers, drum machines and personal computers into

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▶NCC TELECOMMUNICATIONS '86

Show off to shaky start

Registration is light; seminars are sliced.

BY BOB WALLACE
Senior Writer

PHILADELPHIA — The NCC-Telecommunications '86 show scheduled to begin here today is stumbling even before it is up and running.

Advanced registration for the inaugural NCC-Telecommunications is light, and the cast of vendors not exhibiting at the show reads like a who's who list of industry heavyweights. MCI Communications Corp., US Sprint Communications Co., Northern Telecom, Inc., Rolm Corp., NEC America, Inc. and Mitel Corp. are all staying away. Not one of the seven members of the National Telecommunications Network, a consortium of regional fiber-optic carriers, has chosen to participate in the three-day show.

AT&T, IBM, Racal-Milgo, Inc., Gandalf Data, Inc. and Infotron Systems Corp. are among the few industry powers that will exhibit.

Due to a lack of user interest, the American Federation of Information Processing Societies, Inc. (Afips), which is sponsoring the show, has canceled the 18 Professional Development Seminars scheduled to be held in conjunction with NCC-Telecommunications.

Afips is negotiating to relocate next year's show to the Infomart in Dallas and hold it later in the fall. It is hoped that the date change will take NCC-Telecommunications '87 out of competition with the long-running and solidly entrenched annual conference of the Telecommunications Association (TCA), which begins later this month.

Lower-than-expected attendance at Afips' flagship National Computer Conference show, which was held in Las Vegas in June, forced the organization to pare its headquarters staff by about one-half.

Few of the vendors that will exhibit at NCC-Telecommunications are expected to use the show as a staging ground for new product announcements (see "Avant-Garde to debut upgraded Net/Alert," page 6). A variety of exhibitors told *Network World* last week they have no plans to introduce products or services at the show. Some vendors have opted to wait and debut their wares at the TCA show, which begins Sept. 22 in San Diego. Afips claimed that, as of Aug. 29, 68 companies had agreed to exhibit at the show. That includes 11 business or communications trade publications.

One show exhibitor, who requested anonymity, explained, "We are going to save any new product announcements for a better showplace, like TCA." AT&T, Infotron Systems and Racal-Milgo maintained they would not announce new products or services at the show. IBM would not comment on whether it would be unveiling new products at the show.

Timeplex, a Woodcliff, N.J.-based telecommunications equipment producer, originally planned to exhibit at NCC-Telecommunications '86 but later withdrew.

Thomas Nunan, director of corporate communications for Timeplex, said 1986 was not the year the company wanted to exhibit at a new communications trade show. "Our marketing requirements will be served better by exhibiting at TCA, [International Communications Association] and at the [Communications Managers Association] show," he stated.

Confusion exists as to where NCC-Telecommunications '87 should be held. Carl Kleckner, NCC-Telecommunications '86 general manager, argued the show should be held on the East Coast to minimize overlap with TCA. He spoke of an earlier plan to hold the show in San Francisco but added that it had been scrapped. "It did not make sense to have the show in Califor-

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Premiere's national net backup system may be able restore lost data within 24 hours and cut dial-up line costs. **Page 21.**

NEW PRODUCTS AND SERVICES

New software from S&H Computer Systems automates mail-handling to make electronic mail a lot more attractive to users. **Page 23.**

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A musical instrument interface called Midi lets keyboardists integrate sound to the funky beat. **Page 1.**

NETWORK WORLD

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▶INTEGRATED NETWORKS

PacBell ends Victoria's reign; new trial is slated

ISND-like service 'a technical success.'

BY MARGIE SEMILOF
Senior Writer

DANVILLE, Calif. — Calling its beta test a technical success, Pacific Bell last week completed testing Project Victoria, an Integrated Services Digital Network-like service. The Bell operating company said it will begin a similar trial of the service before the end of the year.

Project Victoria's specifications include five data channels and two 32K bit/sec voice channels, all of which operate simultaneously. One data channel can carry a 9.6K bit/sec transmission, while transmissions on the other four data channels run at 1,200 bit/sec.

Customers using the service were only connected to the one 9.6K bit/sec data channel. The other four lower speed connections were used for loop-back testing. Multiplexers are located at both the user and switch sites and are linked by standard RS-232 interfaces via twisted-pair wire.

During the project's four-month trial, approximately 200 users in this community were given Apple Computer, Inc. Macintosh computers to access several information sources, including Dow Jones Information Services Group's News/Retrieval service and MCI Communications Corp.'s MCI Mail.

Pacific Bell will analyze the results of the trial during the next 30 days, according to Michael Eastwood, executive director for new network applications at Pacific Bell. "We will then share the information with the test participants before we divulge usage characteristics of the test with the outside world," he commented.

The technology used in Project Victoria is intended to provide a transitional service to ISDN, according to Scott Smith, a Pacific Bell spokesman. It conforms to CCITT 1B+D ISDN specification, which uses two 32K bit/sec voice channels and one 16K bit/sec data channel. Smith added that the project can readily be made compatible with other future ISDN architectures, such as the more popular 2B+D specification, which calls for two 64K bit/sec voice channels and one 16K bit/sec data channel.

Officials at Pacific Bell plan an additional Project Victoria trial by year end but were unwilling to disclose differences between the two trials or whether the test will be conducted by Pacific Bell employees or residential users outside of the company.

The future of the trial may be clouded by IBM's claim that the multiplexing capability used in Project Victoria is really protocol conversion because of the way the bit stream is modified. If that were the case, the service would be considered an enhanced service, which BOCs are not allowed to provide under the strictures of the Modified Final Judgment.

"We will have to go back to the FCC and define how the multiplexing works," Eastwood said. "The capability used in Project Victoria is really no different than what we provide in other areas on our network today."

Some industry analysts claim the significance of the trial's results may be watered down because half of the project users were Pacific Bell employees. However, BOC officials stated that the trial, which began last March, was intended to test the operation of the hardware and software and was not specifically designed as a market study.

Pacific Bell plans to have a commercially available service like Project Victoria available by the end of next year.

▶INDUSTRY INSIGHT

Firms feel LU 6.2 push

Vendors assess growing user pressure.

BY PAM POWERS
Senior Editor

Although users expect vendors to commit fully to support of IBM's LU 6.2, most of them don't expect vendors to provide that support immediately.

Introduced in 1982, LU 6.2 is a strategic enhancement to IBM's Systems Network Architecture. LU 6.2, in conjunction with Physical Unit 2.1 SNA protocols, is commonly referred to as Advanced Program-to-Program Communications (APPC), which, when fully implemented, will allow a variety of processors to communicate on a peer basis through software. In recent months, a variety of vendors have jumped on the bandwagon, announcing current or future support for APPC.

Vendors contacted by *Network World* last week said users are eagerly anticipating the era of distributed processing APPC promises to facilitate. But, they said, most users just aren't sure how LU 6.2 will fit into their future networking plans.

Anthony Percy, director of product planning for Applied Data Research, Inc. (ADR), said, "Users think LU 6.2 is strategic, but they don't really understand yet how it relates to their needs." ADR, a data base management system vendor, supports LU 6.2 with its electronic mail software and plans to implement it within other products.

According to Percy, IBM's own support of LU 6.2 has been erratic — a situation that has slowed other vendors' implementations. "While our users perceive LU 6.2 to be important for future networking, they realize IBM has yet to provide all the pieces," Percy said.

Jean Hazelwood, senior product manager of IBM integration products for Wang Laboratories, Inc., concurred with Percy. She said Wang supports LU 6.2 in its Disoss gateway and plans to support it in two other products, one of which will be announced within the month. "A lot of customers say that LU 6.2 is important to them," Hazelwood said. "But right now, it's more important in terms of interfacing to Disoss, not in terms of running full-blown APPC."

Thus far, only one Wang customer, based in Europe, has set about writing its own applications for APPC. Hazelwood predicted that the complexity of incorporating LU 6.2 support will discourage developers, unless the application involves many users and has great potential.

Joe Clabby, communications product manager at Data General Corp., offered a dissenting opinion. He said LU 6.2 simplifies the programming process. He said DG offers an LU 6.2 application program interface, an interface to Disoss and LU 6.2 SNA Distribution Services (Snads) support. In the past six months, Clabby said DG has enjoyed a 70% increase in orders for its SNA-related products, which he attributed to DG's strong support of LU 6.2.

LU 6.2 support for DPS

In the first quarter of 1986, Honeywell, Inc. announced support of LU 6.2 for its DPS family of systems. According to Don McGinley, principal product consultant with the Office Marketing and Systems Division at Honeywell, the company has encountered "constant demand" from its customer base to support a native LU 6.2 interface to Disoss. He said as many as 90% of Honeywell's customers running Disoss had requested such support.

Digital Communications Associates, Inc., manufacturer of the Irma board and other communications products, also views LU 6.2 as part of its future direction but has not yet implemented support on any product. In August, DCA announced its intention to support LU 6.2 and penned an OEM agreement with Communications Solutions, Inc. for LU 6.2 software.

▶NETWORK STANDARDS

New Bell facilities test for ISDN compatibility

Bell Northern Research tools allow vendors to test CPE and networks.

BY KARYL SCOTT
Washington, D.C. Correspondent

OTTAWA — Bell Northern Research recently introduced testing facilities that allow vendors to measure network and customer premises equipment conformance to Integrated Services Digital Network standards.

Bell Northern Research — a research and development company owned 70% by Northern Telecom Ltd. and 30% by Bell Canada — unveiled the ISDN CPE Test Facility, which enables telecommunications and computer vendors to test customer premises equipment for ISDN compatibility. Vendors may test equipment at Bell Northern Research here, or through a remote link to the company's facilities.

Participants in Bell Northern Research and Northern Telecom ISDN trials in the U.S. this November will have access to the CPE Test Facility. This group includes Mountain Bell, Pacific Northwest Bell and Bell Canada as well as a number of equipment vendors that have not yet been named.

Bell Northern Research will also make the test facility available to any vendor wishing to evaluate equipment compliance with ISDN standards, according to Cho Lun Wong, director of ISDN planning at Bell Northern Research.

Several American and Japanese equipment vendors have been using the testing facility since June.

Bell Northern Research has also developed an automated test system to evaluate ISDN networks. The ISDN Test and Traffic Simulator (Tats) is designed primarily to test ISDN switching nodes while they are developed, Wong said.

Tats will be used to assess performance specifications in the transmission of voice, data, text and video over various ISDN facilities. It was designed for internal Bell Northern Research laboratory use and has not yet been offered to other firms wishing to test their networks' compliance with ISDN. Eventually, however, both test facilities may be marketed to outside companies.

ISDN Tats will test communications protocols and products that comprise an ISDN network. "We can exercise all the features being developed for ISDN and verify internetworking with existing digital Centrex and packet features," said Robert Wood, director of ISDN development at Bell Northern Research. "The system will test the full functional range of ISDN products, under normal and stressed conditions."

The test tools are based on Northern Telecom's DMS 100 switch running with new hardware and software modules that provide ISDN functions. AT&T has a similar test facility based on its 5ESS switch.

While independent equipment makers will be testing their equipment's compatibility with either

See **ISDN** page 8

▶FACTORY NETWORKS

IBM, INI dance MAP duet

BY BOB WALLACE
Senior Writer

CHICAGO — In a move expected to accelerate user acceptance of advanced factory networking technology, IBM and Industrial Networking, Inc. (INI) debuted products compatible with the Manufacturing Automation Protocol at the International Machine Tool Show here last week.

MAP is a layered communications protocol designed to allow factory floor equipment manufactured by different vendors to communicate over a broadband, coaxial cable-based, token-passing bus-type local-area network.

IBM reaffirmed its support of the MAP factory communications specification with its unveiling of a MAP Pilot Kit designed to enable prospective MAP users to familiarize themselves with the technology. In addition, IBM and INI jointly announced the immediate availability of a two-board interface set — dubbed the MP-500 MAP Interface Adapter — that allows IBM Personal Computer XTs and Personal Computer ATs and IBM's family of industrial computers to be connected to MAP-compatible, broadband, token-passing bus local nets.

Big Blue also announced a pair of MAP-compatible software programs and an I/O driver that links the MP-500 MAP Interface Adapter and applications running on IBM's industrial computers. The driver is known as the IBM DOS Support for Token Bus Network Adapter, and it provides a user with a simple programming mechanism for developing MAP applications.

IBM's MSS-10 Network Monitor Software, Release 3.0.1, monitors traffic on the MAP network and provides summary data in graphic form. MSS-30 Network Traffic Analyzer Software, Release 3.2, supports in-depth problem determination. Both packages are produced by INI.

IBM and INI announced they had joined forces to develop MAP-compatible products at the MAP Users Group meeting in Toronto in mid-January. The two-board MAP interface set is the first fruit of that pact.

Although IBM has used INI equipment extensively in factory networking demonstrations at several trade shows, IBM maintained it would not resell INI equipment. The computer giant has done an about-face on this issue by announcing that the INI-manufactured Personal Computer interface boards can be purchased directly through it.

Both IBM and INI offered MAP-compatible products prior to this latest product announcement. IBM has been peddling a pair of MAP-compatible software packages designed to link its Series/1 minicomputers to broadband MAP nets. INI offers MAP/One, a MAP-compatible local-area network package that has already been installed in General Motors Corp.'s three Truck and Bus plants.

These three facilities, which will eventually use MAP nets to handle day-to-day automobile production, represent GM's lead MAP technology project ("GM details MAP project," *Network World*, May 26).

IBM's increased support of MAP is seen by automation analysts as assuaging corporate management's fear of experimenting with the ad-

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▶LABOR UPDATE

IBEW, BOC still at odds

Although members of the International Brotherhood of Electrical Workers (IBEW) "conclusively" voted down a proposed contract with New England Telephone last week, eleventh-hour negotiations were expected to ward off a strike.

The 20,000 IBEW members had until Saturday to ratify the proposed contract. Negotiations between the two parties were scheduled for Friday morning, according to the IBEW.

Union official James Kiley, IBEW business manager of Local 2323 in Cranston, R.I., said he anticipated a strike would be averted. With about 70% of the members having voted by late last week, the company realized the members were unhappy with the proposal, he said. Kiley said he presumed the company would "address the problem issues." One of two main sticking points is a company proposal that would allow work to be contracted out rather than be performed by IBEW members. Another is enforced overtime.

New England Telephone would not confirm that negotiations were scheduled for Friday.

— *Nadine Wandzilak*

▶SATELLITES

M. Marietta will launch

WASHINGTON, D.C. — In a boost for the satellite services industry, Martin Marietta Corp. said last week it had contracted to launch a communications satellite for Federal Express Corp. in 1989.

The deal makes Martin Marietta the first U.S. company to schedule a commercial launch. The Reagan administration has encouraged U.S. firms to fill the launch void left in the wake of its decision to bar the National Aeronautics and Space Administration from using space shuttles as commercial launch vehicles.

Federal Express paid an initial fee of $100,000 to set the launch appointment. The final cost of the deal was not disclosed.

Also, the French launch agency Arianespace said it had scheduled seven launches for next year and at least eight launches for both 1988 and 1989.◪

▶INDUSTRY UPDATE

Oshman elected to StrataCom board

BY PAM POWERS
Senior Editor

CUPERTINO, Calif. — StrataCom, Inc. last week announced the election of Ken Oshman, former president and chief executive officer of Rolm Corp., to its board of directors.

Oshman resigned from Rolm in January 1986, after 17 years with the company. At StrataCom, he joins other former top executives from Rolm, who left the company in early 1986 to found the new start-up.

Stratacom board wields influence

"Ken Oshman intends to actively participate in the direction of the company," a StrataCom spokesman said.

"As StrataCom is privately held, the board of directors has a lot of influence."

StrataCom manufactures and markets a T-1 voice and data multiplexer, the Integrated Packet Exchange (IPX).

The IPX operates on packet-switching technology, and StrataCom claims it is the first product of its kind on the market.

After beta-testing the product at Michigan Bell in 1985, the company announced the IPX and began shipping in July 1986.

Two early users

Currently, IPXs are installed at May Co. of Southern California and at Joske's, a division of Allied Corp. located in Texas ("T-1 mux unveiled," *Network World*, July 14).

StrataCom expects revenues between $1 million and $2 million by year end 1986, and is estimating growth to $15 million by the end of 1987.◪

▶LOGISTICS

Department of Defense establishes users group

Cals to unite buying power of military.

BY KARYL SCOTT
Washington, D.C. Correspondent

WASHINGTON, D.C. — The Department of Defense has taken a cue from commercial users groups and formed one of its own. It's called the Computer Aided Logistics Support (Cals) program. This prodigious undertaking is an attempt by the Defense Department to leverage its massive purchasing power and influence the development of computer and communications products and standards.

Cals is designed to create an integrated digital information processing system that will support the myriad of defense logistics programs undertaken by various branches of the armed services. Logistics is the military science involving the procurement, maintenance and transportation of military materials.

The Defense Department elaborated on its plans last week at the Federal Computer Conference here.

Cals will create a network of interwoven data bases, explained C. Bruce Lepisto, Cals action officer in the Office of the Assistant Secretary of Defense. Through those distributed data bases, the Defense Department can track the progress of arms development programs, for example, from the time a contract is awarded, through product design, manufacture and delivery, all the way to long-term maintenance of equipment such as jet fighters and submarines.

> *"Cals will create a net of interwoven data bases."*

The distributed data bases will appear to the user as a single integrated data base connected by a series of local- and wide-area networks and intelligent gateways.

The system will provide communications links from the Defense Department and industry weapons system designers to the factory floor, parts warehouses, product documentation libraries and accounting offices. The desired effect will be to improve the efficiency and effectiveness of logistics support by integrating and leveraging computer and communications resources.

For example, in the desired scenario, the Defense Department will be able to access electronically the data bases of a defense contractor for information about a new jet fighter under development.

The manufacturer will be able to transmit complex engineering drawings electronically to the Defense Department and update design changes quickly, eliminating the time and paperwork currently associated with such a project.

The Cals program may use currently available products and tech-

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"ABC membership applied for"

ABP

▶REORGANIZATION

AT&T merger under way

BY PAM POWERS
Senior Editor

AT&T last week began the much-heralded reorganization that will merge its Information Systems and Communications divisions into one business.

The move takes advantage of the Federal Communications Commission's relaxed structural separation rules. The new organization is aimed at streamlining AT&T's sales and service efforts.

Under the new structure, AT&T's forces are subdivided under Vice-Chairman Randall Tobias into four divisions: the Business Markets Group, the General Markets Group, the Network Operations Group and the Special Markets Group.

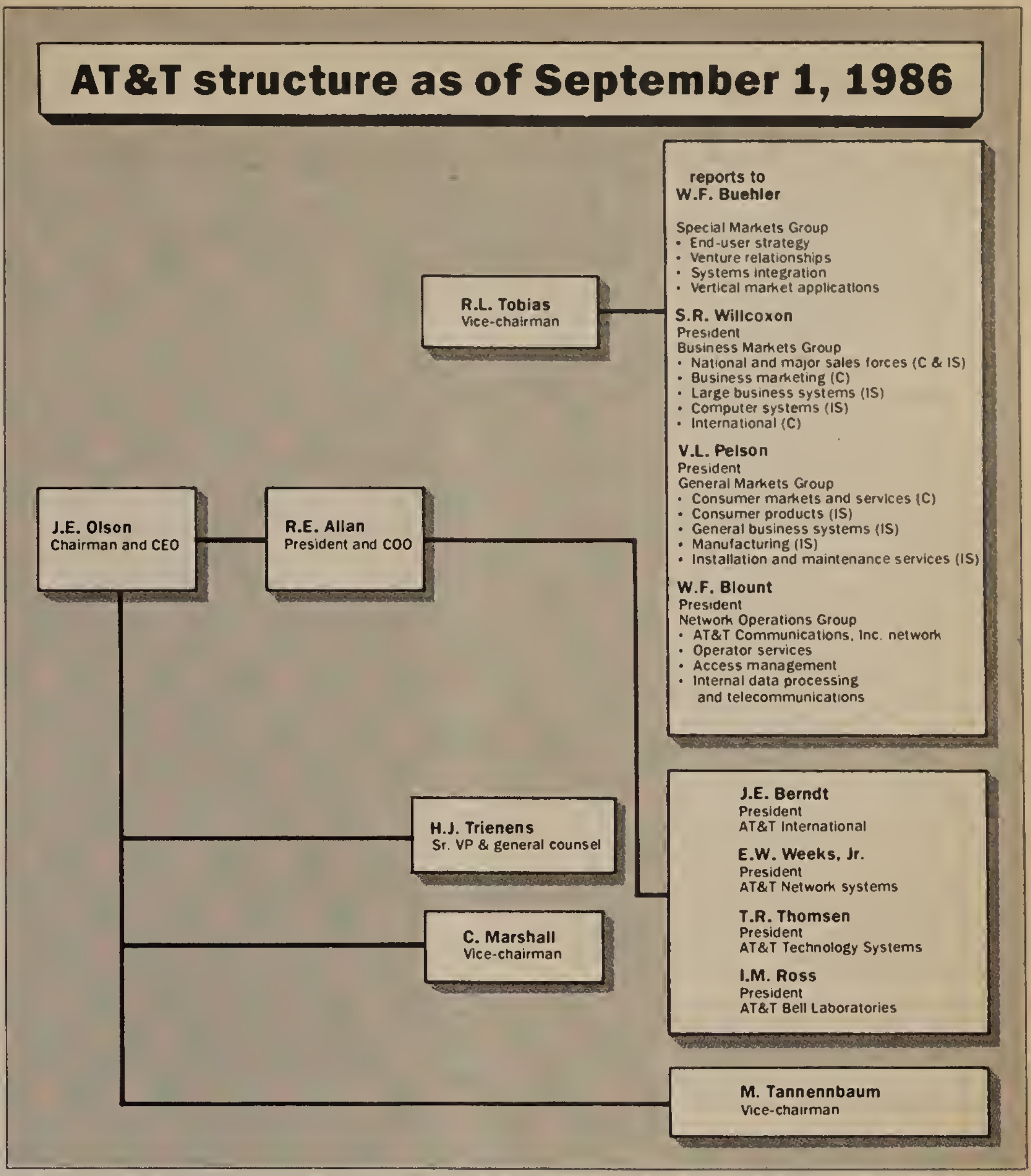
The Business Markets Group was initially slated to be run by President Robert Casale, who has since left AT&T to work with Kidder, Peabody and Co., Inc. Instead, the roughly 34,000 people in the Business Markets Group will report to W.F. Buehler, group vice-president for personnel and transition management. The group will market equipment and services to large and mid-size business accounts.

The General Markets group, headed by President V.A. Pelson, will handle AT&T's small business and residential accounts. General Markets employs approximately 71,000 people. Both the General Markets and Business Markets groups will independently handle all sales, support and servicing of equipment to their target customers.

Network Operations, under W.F. Blount, is responsible for some 600 million miles of network routes owned by AT&T, including operator services, T-1 networks and fiber backbones. Network Operations will have some 84,000 employees.

Special Markets, the smallest of the four groups, was described by a company spokesman as essentially a think tank of some 200 strategists responsible for managing AT&T's joint ventures and partnerships and coordinating marketing strategies among the groups.

AT&T structure as of September 1, 1986



International update

CW Communications International News Service

TOKYO — Mitsubishi Heavy Industries, Ltd. (MHI) and Nissan Motor Co. have launched ambitious networking projects to link offices and plants across the country.

MHI, one of Japan's largest shipbuilders and civil engineering contractors, will take a two-step approach to connect 60 offices and production sites — including 20 offices of affiliate Mitsubishi Motors Corp. — using over 1,050 miles of digital transmission facilities. The project will cost $19.5 million.

Nissan, Japan's No. 2 automaker, inaugurated a one-year plan to upgrade its current system linking roughly 500 dealers and parts vendors throughout Japan. For the existing system, Nissan leases 26 Nippon Telegraph & Telephone high-speed digital lines to connect its Tokyo office with more than 50 branches and subsidiaries. With this upgrade, Nissan expects to realize an 8% cut in annual communications costs, down to $14.8 million.

STOCKHOLM, Sweden — LM Ericsson has announced layoffs involving 4,800 workers — 2,800 of them in Sweden. For the first time in many years, the employee cutbacks will affect Public Telecommunications, Ericsson's most important division.

Ericsson, the world's fourth largest switch manufacturer, has marketed its AXE switching system for the last five years. The company's losses totaled $100 million last year.

LONDON — At British Telecom, the UK's privatized communications carrier, Sir George Jefferson, chairman and chief executive for six years, is stepping down. The 65-year-old chairman, who piloted British Telecom through regulatory changes, will relinquish his chief executive role in October, while still remaining chairman. Iain Vallance will replace Jefferson as chief executive. Vallance, 43, is currently chief of operations, a post he has held for less than a year. He was previously managing director of British Telecom's local communications division.

TOKYO — Japanese office equipment vendor Canon, Inc. has joined forces with Continental Telecom, Inc. (Contel) of Atlanta to sell its facsimile in the U.S. beginning this month. The move pits Canon againt Ricoh Co., a Japanese firm already entrenched in the U.S. telecom market via an early tie-in with AT&T.

Under the deal, Canon will supply Contel with 200 to 300 units of $2,490 desktop telephone facsimiles a month. Executone, Inc., a N.Y.-based Contel affiliate, will market the Canon products.

APELDORN, Netherlands — Philips International BV, based here, last week entered into an agreement with The Orion Group, Inc. of Berkeley, Calif., through which the companies will integrate two of Orion's IBM Systems Network Architecture connectivity software packages into Philips' product line. The software will allow Philips processors to operate IBM SNA networks.

Philips and Orion will also undertake joint development work involving other SNA software.

Resale from **page 1**

will install and maintain used telecommunications gear marketed by equipment resellers.

"AT&T has set up an entire secondary market program where they will work with remarketers," Vogt said. "AT&T will support the systems, and it is really working to make that known."

In supporting the used telecommunications equipment market — by agreeing to install and maintain used AT&T equipment — AT&T has taken a page out of IBM's book, Vogt said. IBM has a similar approach to used equipment.

Charlie Greco, vice-president of financial services at International Data Corp., a Framingham, Mass.-based market research firm, said AT&T learned a lesson from IBM, which at first resisted cooperating with computer equipment resellers. "AT&T has gone out and wined and dined the resellers," he said. "It took IBM 20 years to realize there was a secondary market where an equipment manufacturer could make money."

According to William Pinkerton, vice-president of the telecommunications division at CMI Corp., a Bloomfield Hills, Mich., equipment lessor and remarketer, AT&T has chosen to support the secondary equipment market in order to spur sales of its new equipment.

"AT&T usually isn't the low bidder for a new switch, but customers know that if they buy AT&T equipment, it will have resale value," Pinkerton said.

Sam Khedkar, manager of industry relations for AT&T's special markets group, said his company began its support of the used equipment market at the time AT&T began offering customers the option of buying their embedded base of equipment. "We maintain and service all of the equipment that bears our logo," Khedkar said.

Tom Oswald, a communications analyst at The Stroh Brewing Co. in Detroit, said his company plans to install a used AT&T Dimension 2000 private branch exchange, after having looked at a new AT&T System 85. "We decided that the system would meet our needs and could be upgraded down the road when necessary," Oswald said.

AT&T's considerable clout has helped legitimize the used telecommunications market. However, David Potter, president of Richardson, Texas-based Source, Inc., one of the country's largest telecommunications equipment remarketers, said his company also sells equipment made by other manufacturers, including Northern Telecom, Inc., Rolm Corp. and Siemens Communications, Inc.

Both Potter and CMI's Pinkerton said the pending repeal of the investment tax credit in the tax reform package approved recently by a key congressional committee will also add momentum to the used equipment market. The loss of the investment tax credit would add 10% to the price of new gear.

According to Potter, as some companies turn to new, technologically advanced PBXs, others are willing to buy the old switches, which may not boast leading-edge technology but offer reliable service.

Lynn Keller of Comark, Inc., a Chicago-area telemarketing company, bought a used Northern Telecom SL-1 digital switch from Source several years ago. "When I saw the price for the used equipment, I couldn't justify buying a new PBX," said Keller, who is planning to replace the 30-trunk PBX.

▶ NCC-TELECOM '86

Avant-Garde to debut upgraded Net/Alert

PHILADELPHIA — In one of the few product announcements expected to trickle out of the NCC-Telecommunications '86 show opening here today, Avant-Garde Computing, Inc. will unveil enhancements to its Net/Alert network monitoring system.

The Mt. Laurel, N.J.-based Avant-Garde will introduce Net/Alert Release 6.0, which boasts software enabling users of IBM Personal Computer ATs or compatibles to manipulate performance and usage data stored in the Net/Alert data base. Also being added are new screen display formats and a real-time transaction tracing module.

The software-based Net/Alert system monitors leased-line data networks for performance and usage information. A line monitoring unit passively plucks performance information from transmission lines and passes it along to a processor. The data is displayed in real time on a color graphics terminal attached to the processor and is stored in a data base.

The personal computer software being added to the system allows users to custom design performance and usage reports by supporting direct access to the system's data base. Previously, the color graphic terminal was used to display predefined and formatted historical performance and usage reports derived from the data base.

The new release also includes updated screen formats that display the most critical information concerning the network's status and performance. The new real-time transaction tracing tool reportedly displays the exact point of a network transmission line disruption. A Net/Alert system monitoring 32 transmission lines lists for $40,000. Current licensed systems will be upgraded.

— *Jim Brown*

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NCC from **page 2**

nia in the same month as TCA," he explained.

Rick Dobson, exhibit sales manager for Afips, said Afips is close to inking a pact with Infomart that would bring the troubled show to Dallas in 1987. "We are in the process of negotiating for late fall dates, probably in November, with Infomart. We have every intention of holding the show there next year," Dobson asserted.

Kleckner maintained that confusion created by the 1987 show site issue has hurt both vendors and users alike. "The fact that Afips has not announced where the show will be held next year makes exhibitors question whether we will have the show next year or not," he contended. "We need to eliminate this uncertainty immediately."

The show program manager said the decision to ax the Professional Development Seminars was difficult. "We are trying to build a conference that meets the needs of the users that attend," Kleckner related. "We agonized over this decision. We were not getting the response for the seminars that we expected."

Dobson claimed "a couple thousand individuals" had preregistered for the show at press time.

British from **page 1**

This facility will serve as the air carrier's North American data processing and network management center. British Airways has gutted the building completely and will install all of its communications equipment, computers and wiring in the stripped-down structure.

British Airways' corporate data center, located at London's Heathrow Airport, houses 13 mainframe computers and is linked to the New York facility via transatlantic cables. Data traffic travels through the New York headquarters and over point-to-point leased lines to Toronto and several U.S. cities.

The new communications network, which will handle the airline's voice, data and reservations traffic, will be built around hub sites in Chicago, Miami, Toronto and at JFK Airport in New York, in addition to the new headquarters.

Richard Roff, director of information management for British Airways, explained that the network hubs will be connected in a ring-like network topology. Each node will be connected to two other nodes with 56K bit/sec Dataphone Digital Service communications links and will house network switching equipment, such as private branch exchanges, and network monitoring and control gear.

The leased lines, which currently connect all major locations directly to the company's New York headquarters, will be terminated. Roff would not divulge the cost of operating the leased lines.

The decentralization of the North American communications net will require British Airways to link additional network nodes to the Heathrow facility. The net's Toronto and Miami hubs will also be linked to the Heathrow site via transatlantic cables, Roff said. Voice and data traffic will be gathered at the individual hubs and then passed to London.

Roff said British Airways, which is owned by the British government, wanted to discontinue funneling all voice and data traffic through the company's North American headquarters.

"We realized by redesigning the network that we could take certain precautions that would increase our ability to keep the network operational at all times," Roff explained. "No matter how many vendors you contract with to provide local-loop connections, all traffic seemed to be directed to our New York building using a single path. One backhoe digging in the wrong place could bring our network down," he said.

Distributing system control throughout the revamped network is designed to mitigate the impact of any single point of failure in the British Airways network, Roff said. "If any one of the network nodes fails, we can route traffic through one or more of the remaining network nodes," he claimed.

Distributing network management and control throughout the communications network would allow system monitoring to be performed at any of the network nodes. Roff added, "We hope the nodes will one day be unmanned with all network management handled automatically."

The equipment will be used to identify degradations in services and to spot equipment failures and service interruptions quickly. Roff added that the network control systems located at each individual network node would be used to redirect voice and data traffic over secondary facilities if the primary facility fails.

The cutover from British Airways' current network to the decentralized communications net will require Roff and company to operate both networks simultaneously for roughly six months, Roff explained. "We chose this cutover method because we want to get everyone settled and install all the new equipment."

Roff said the divestiture of AT&T has complicated British Airways' planning for the multicity communications network. "We have discovered that although AT&T has tremendous resources at its disposal, it is not as well organized as we would like it to be. AT&T is neither omnipresent nor omniscient."

"The problem is," Roff continued, "none of the necessary AT&T people talk to each other anymore. We found ourselves in situations where we were introducing AT&T to our [Bell operating companies]. This is extremely frustrating when you are looking to sign for end-to-end communications services."

Ruff said other long-distance carriers such as MCI Communications Corp. and US Sprint Communications Co. have been aggressive in their efforts to supply British Airways with network services.

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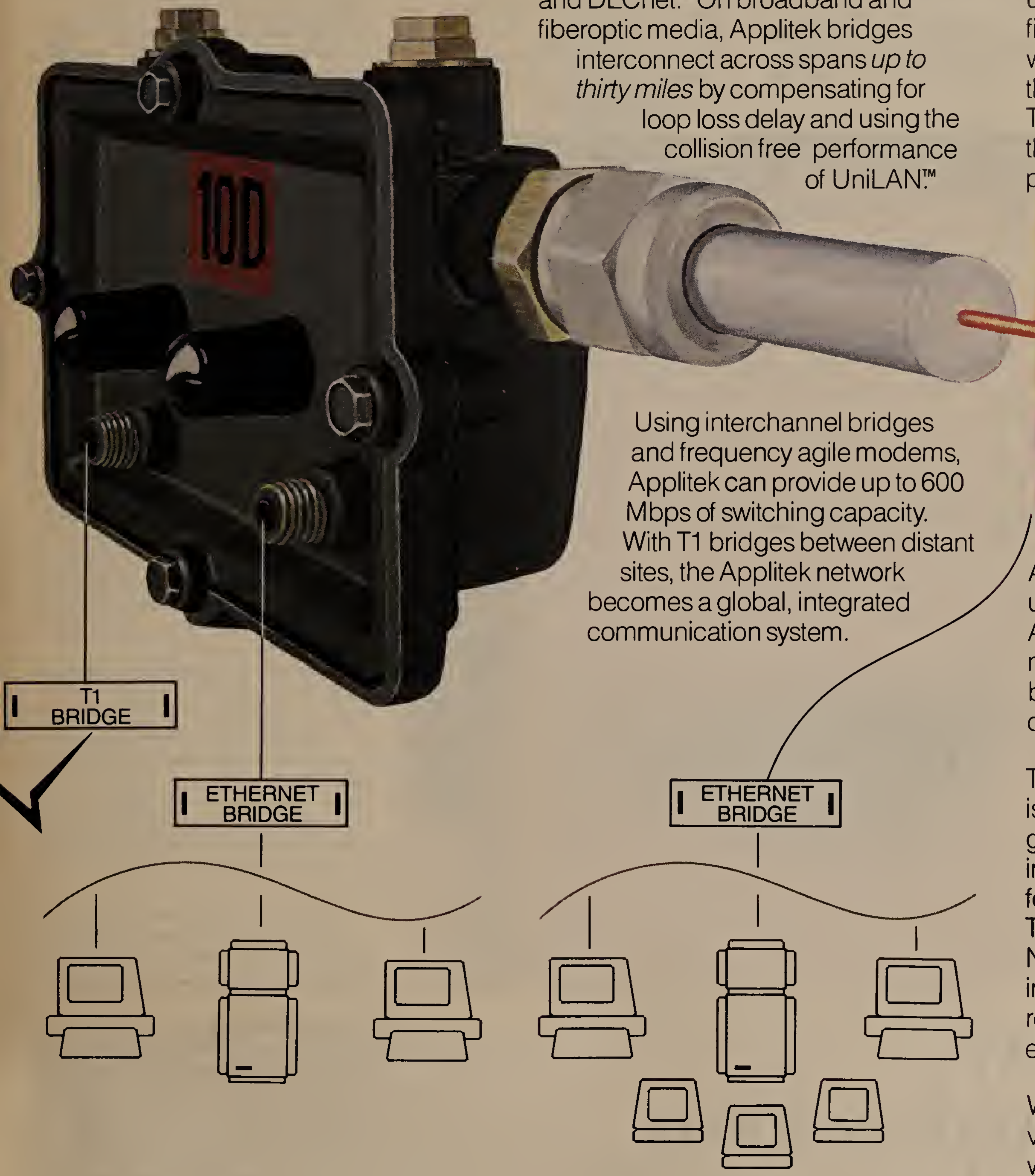

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DEC from **page 1**

uct, PC All-in-1, enables users to work with DEC All-in-1 office system applications as well as Personal Computer programs.

Analysts praised the products for their simplicity and DEC for its consistency in widening the breadth of its product line. Unlike other vendors, such as IBM, DEC has focused on a few key technologies, like Ethernet, and built its products around them.

The firm was also lauded for working to minimize inconsistencies among its various product offerings. For example, a word processing package included in the announcement has the same features, commands and functions as versions of the package running on other DEC systems. Other vendors have developed inconsistent versions of their products, which has caused users a great deal of frustration.

VAXmate/VMS Services enables a VAX, MicroVAX or VAXmate to act as a server on a network of VAXmate, IBM Personal Computer and DEC Rainbow computers all equipped with thin wire Ethernet connections. A server can act as a typical VMS server and supports DECnet network management functions such as file transfer services, network control and VT220 and VT240 terminal emulation.

Devices can be connected to the server over a thin wire Ethernet connection, which supports transmission speeds up to 10M bit/sec. Users can work with and share programs and files written for DECnet or Microsoft MS-DOS 3.1.

Files can be stored in either MS-DOS or VMS format at any node on a network. A data conversion feature that resides on the server enables users to change VMS files to MS-DOS format and vice versa.

MS-DOS applications have to be written for Microsoft's MS-Windows, which users work with to access the applications. Very few packages have been adapted to MS-Windows. Among the notable absentees is Lotus Development Corp., although a DEC press release stated that Lotus is working on adapting its popular products to work with the DEC offering.

Prices for VAXmate/VMS Services range from $650 to $19,500.

DEC's VAXmate runs both VAX and IBM PC-DOS applications. The microcomputer includes an Intel Corp. 80286 microprocessor, 1M byte of random-access memory, a keyboard that supports both IBM Personal Computer and DEC VAX function keys, a mouse, an RS-423 connection, a thin wire Ethernet connection, a 5¼-inch floppy disk drive and a 14-inch screen.

Options include an expansion box for a 20M-byte hard disk, 2M bytes of additional random-access memory, an integral modem and an Intel 80287 coprocessor. A base system costs $4,295.

DEC claimed that the product is the first microcomputer designed for networking because it includes a built-in Ethernet connection. It marks the company's second foray into the microcomputer arena. A few years ago, DEC announced the ill-fated Rainbow. A chief reason for the Rainbow's demise was its inability to run any IBM Personal Computer software. Until last week, the company appeared unwilling to accept the Personal Computer's dominant position.

PC All-in-1 ties Personal Computer users into DEC's popular office automation software package via thin wire Ethernet connections. The package, which runs on a dedicated MicroVAX II, supports up to 30 users. The base package includes a MicroVAX II with 5M bytes of random-access memory, Ethernet controller, 16 asynchronous ports and All-in-1 office automation software consisting of DEC's WPS word processing software, electronic mail and an electronic filing program.

Personal Computers require 640K bytes of random-access memory, a 10M-byte hard disk drive and a thin wire Ethernet connection to work with the package. Personal Computer users are able to store files on a MicroVAX, but there are no automatic data translation routines to allow a user to move Personal Computer and VAX data.

The price for a base PC All-in-1 system is $81,160, and the product should be available in January.

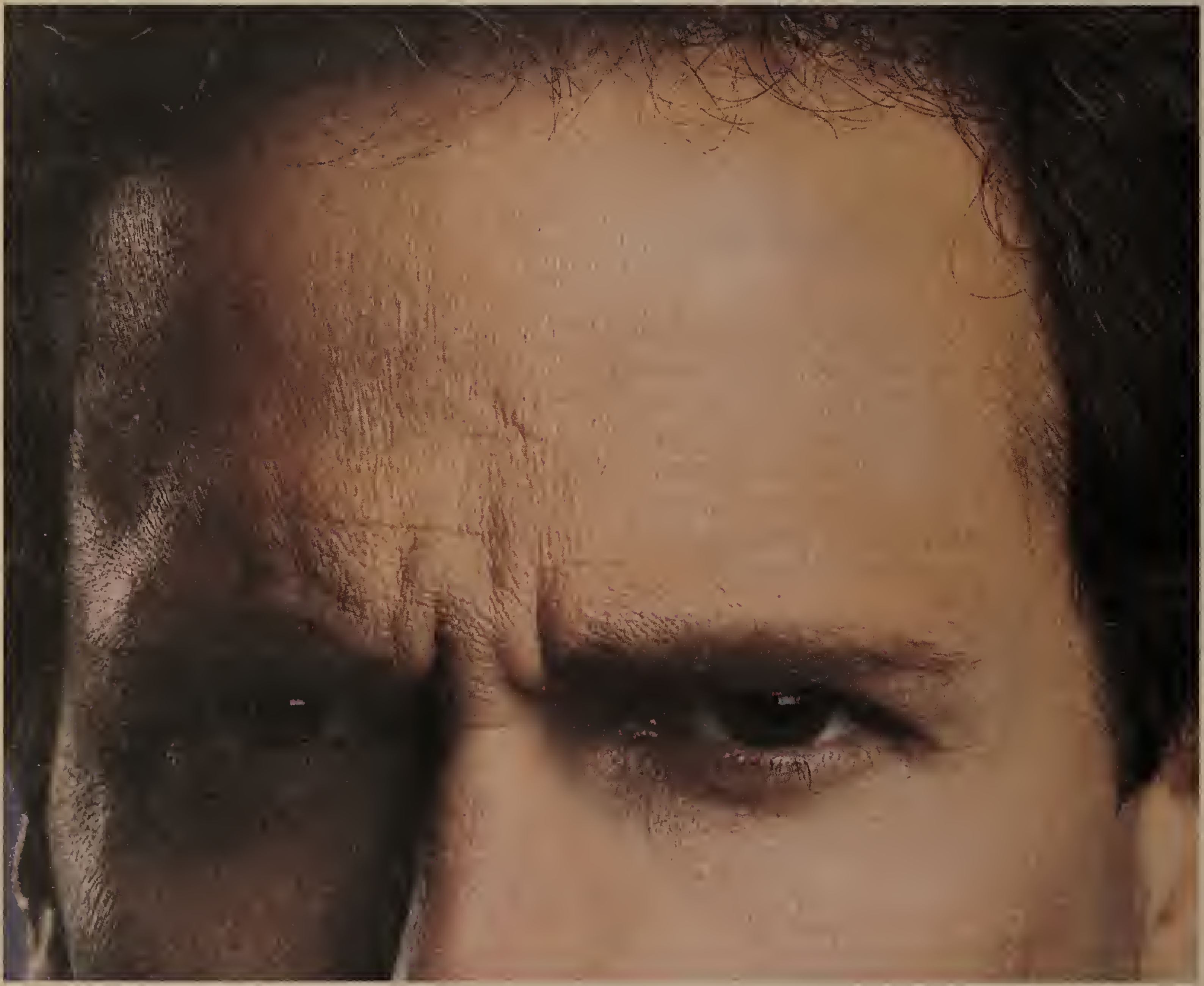
ISDN from **page 3**

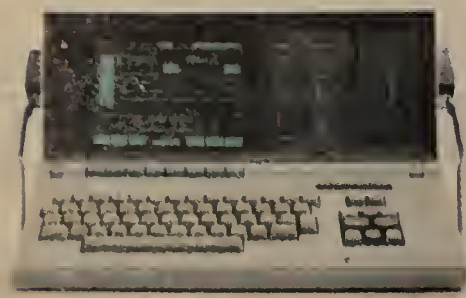
AT&T's or Northern Telecom's ISDN networks in upcoming trials, incompatibility between different vendors' switches is still a problem. An AT&T ISDN switch cannot communicate with a Northern Telecom switch over an ISDN network.

Bell Northern Research's current objective is to foster the development of ISDN products and involve as many participants as possible, Wong said. Making the test facility generally available will encourage development of ISDN, he said.

These new testing methods represent the first step in a verification process designed to determine if ISDN terminals will work with ISDN switches on a network.

Today's ISDN standards correspond to the lower three levels of the International Standards Organization's Open Systems Interconnect model.





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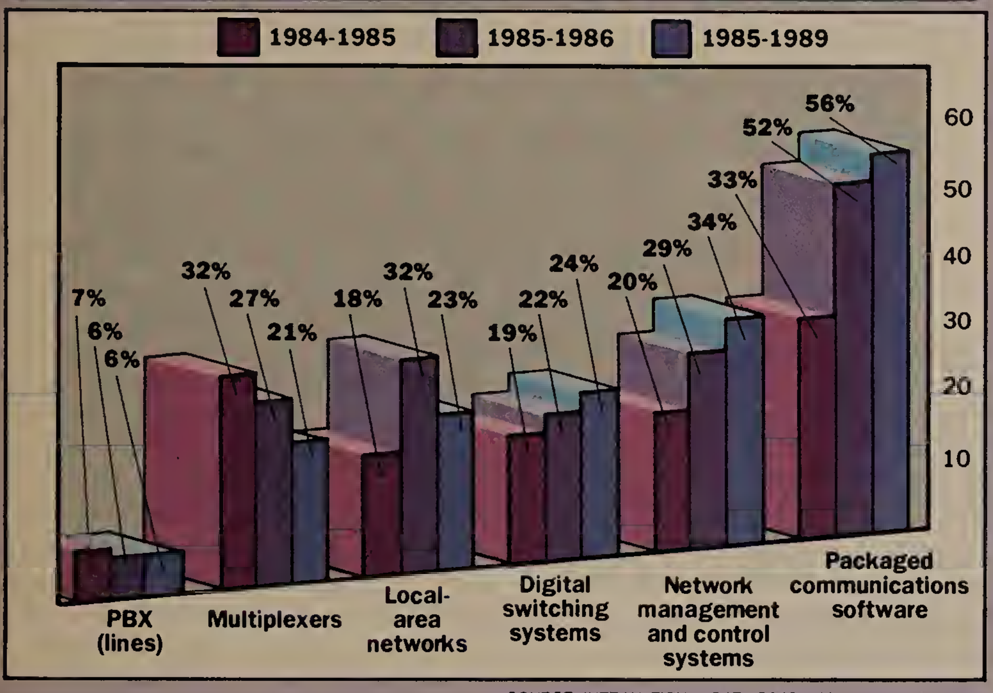
INDUSTRY UPDATE

> “The public switched network will eventually service the majority of business communications needs for both voice and data transmission. Virtual private networks and software-defined networks will have a major impact and will obviate the need for most privately owned networks among large corporations. But voice needs will drive this market. Data will be added onto virtual voice networks.
>
> **From “Analysis of Factors Affecting Data Communications Traffic”**
> Link Resources Corp.
> New York

Dollar volume growth of network equipment markets



SOURCE: INTERNATIONAL DATA CORP., FRAMINGHAM, MASS.

ANALYSIS

Taking stock of new Interlan

Assessing Micom's quiet subsidiary.

BY PAM POWERS
Senior Editor

BOXBOROUGH, Mass. — When Micom-Interlan, Inc. rained product announcements on the industry last month, some questions were raised as to the health of Micom Systems, Inc.'s acquisition, which has kept a low profile since the two companies merged last year.

After four years on its own, Interlan became a wholly owned subsidiary of Micom Systems in April 1985. The company has retained its independent structure, with its president, Mike Barker, reporting to Micom President Roger Evans. Interlan is currently one of five Micom divisions, with approximately 110 people in its employ.

Prior to the merger, Interlan enjoyed some success. “The company, along with Bridge Communications, Inc. and Ungermann-Bass, Inc., was

See **Interlan** page 10

INDUSTRY MOVES

Consultants merge

Ulrich, Doll firms in spotlight.

BY NADINE WANDZILAK
Staff Writer

Two prominent communications consulting firms have moved to strengthen their customer services, particularly telecommunications-related services.

Coopers & Lybrand last week acquired Walter Ulrich Consulting in a move the Big Eight accounting firm said will bolster its services to clients who need office automation and advanced telecommunications systems.

In related news, DMW Group, Inc., the Ann Arbor, Mich., firm headed by well-known industry guru Dixon Doll, reached an agreement in principal to merge with Commercial Software, Inc. (CSI) of New York. The new company, DMW Commercial Systems, Inc., will provide consulting services and off-line network management and telemanagement products in line with its current product offerings.

Better known as a consulting firm, DMW has been inching into the product marketplace over the last two years, according to Doll, who will chair the new venture. Its partner-to-be, CSI, markets network management software that Doll said complements DMW's current telemanagement products. DMW's principal product is Telebox, a system that enables a customer to poll and collect, from remote private branch exchanges at a central location, call detail reports.

DMW Commercial Systems will be a $10 million company, each partner providing roughly half of the revenues. Gerald Mayfield of the DMW Group will head the professional services group and Anthony Abbott, the current president of CSI, will spearhead the software products group. The president and chief executive officer will be Robert Schultz, a former DMW consultant.

Walter Ulrich, founder and former president of the seven-year-old Houston-based communications consulting firm that bears his name will continue to manage the company as a subsidiary of Coopers & Lybrand.

“Coopers and Lybrand is redoubling its commitment to networking and telecommunications,” Ulrich said. ☐

INDUSTRY EYE

PAM POWERS

Matrix switch war heats up

In another small flurry of excitement, word went out again recently that T-Bar, Inc. will act as OEM for its Galaxy matrix switch to AT&T, for use in conjunction with Dataphone II Level IV. To date, Galaxy has been an elusive product, existing on paper but not humming away on anyone's shop floor, so far as we can tell. All this indicates, as we move into Phase II of the AT&T OEM Agreement Preannouncements, that matrix switch vendors are jostling for position in the madding crowd.

Despite some remarkable returns in 1985 (more than 54% growth in matrix sales domestically, according to International Data Corp., a Framingham, Mass.-based market research firm), users obviously don't feel as expansive now as in days of yore. To further exacerbate an already competitive business, some confusing changes in technology and vendor offerings are serving to slow the sales cycle.

Perhaps the most important of these is IBM's recent announcement of the 3728 matrix switch, a product manufactured by Bytex Corp. The 3728, in conjunction with the Matrix Switch Host Facility and Netview, the company's network management package, was designed to provide more global control and management of the network. Characteristically, the announcements made a splash and have since thrown a wrench into user buying decisions. Yet each of the products lagged behind similar offerings already on the market. This bodes well for smaller vendors in that IBM's product is no more feature-rich than its competitors', but the mere presence of Big Blue enhances the appeal of the technology.

Telenex Corp., a newcomer in 1986, introduced its Autonex switch at Interface '86 this year. Anticipating a user migration to higher line speeds in addition to an increase in overall port capacity, Telenex saw a weak link in the product lines offered by the more established vendors. As a result, Autonex allows for migration from 19.2 bit/sec to V.35 without loss of port capacity.

Then there's the question of square vs. distributed matrices. Bytex and T-Bar have introduced switches that signal a move away from square architecture, which locks the user into a set number of input and output ports.

All of this suggests that the Milquetoasts aren't long for this industry. We most likely won't see any significant influx of new products and vendors after this year, and the market is still young enough to sustain considerable growth. But the matrix switch sale is a large and pricey one, which will continue to require extensive vendor resources.

Easy access to the end user is crucial. That will lead to more OEM arrangements with large systems companies. Vendors lacking a diverse product line will experience difficulty cracking the market with meager sales forces. But despite the competition, don't look for any bargains. Rather, systems will grow more sophisticated and consequently, more expensive, during the next two years.

Interlan from **page 9**

one of the leading Ethernet vendors for a period of time," according to Harvey Freeman, vice-president of Architecture Technology Corp. "Then Micom bought Interlan, and it sort of disappeared."

The initial intent of the merger, an idea that never came to fruition, was to integrate Micom's data private branch exchange technology with Interlan's local-area network technology. What has emerged, more than a year later, is a series of products emphasizing support for a wide range of local-area network standards and protocols. What happened in the interim?

It was clear, at the time of the merger, that users of the companies' products were replacing terminals with personal computers, and that communications solutions for the local area would have to address this steady migration. In theory, the concept of an integrated data PBX/local net product provided an answer, but in practice, the company could find no way to gracefully integrate the circuit and packet-switching technologies. As a result, the project was dropped.

Other problems followed. Interlan committed to Xerox Corp.'s XNS protocol, only to discover it was losing market share as systems integrators moved to Transmission Control Protocol/Internet Protocol (TCP/IP).

About the same time, users began to move away from terminal-to-host networking toward general purpose work group and departmental networking. Historically positioned in the terminal-to-host environment, Interlan temporarily came up empty-handed.

Realizing the user need to link work groups with departmental minis, the company assessed its strengths and recently set about providing systems integrators with a wide range of protocol support at the board level. The product introductions have met with approval and indicate the company is reestablishing its identity.

"They are coming out of hiding," Freeman said.

General Electric Medical Systems Group, Daisy Systems Corp. and Delta Resources, Inc. are some systems integrators currently using Interlan products. While Interlan is expected to do well in this market, Ben Occhiogrosso, vice-president of BVI Communications, Inc., sounded a note of caution. "The LAN market is so congested, you have to choose your niches carefully these days," he said. "Bridge is fairly well entrenched in that area."

In another effort to broaden its distribution channels, Interlan is actively seeking strategic alliances. Novell, Inc. is now an OEM for the Interlan PC controller, which it packages with its network operating software, Netware, for end-user sales. The product will run head to head with Etherlink/IBM PC, 3Com Corp.'s personal computer board.

Gabe D'Annunzio, vice-president of marketing programs at Interlan, points to Micom's broad-based manufacturing capability as a chief asset in remaining price-competitive while maintaining profitable margins. Micom maintains manufacturing plants in Southern California, Puerto Rico and the Far East. This allows Interlan such luxuries as producing the NIStar, a Starlan network interface for the IBM Personal Computer, priced some 50% lower than a comparable AT&T offering, and an equally price-competitive Ethernet controller for the IBM Personal Computer, the NI5010.

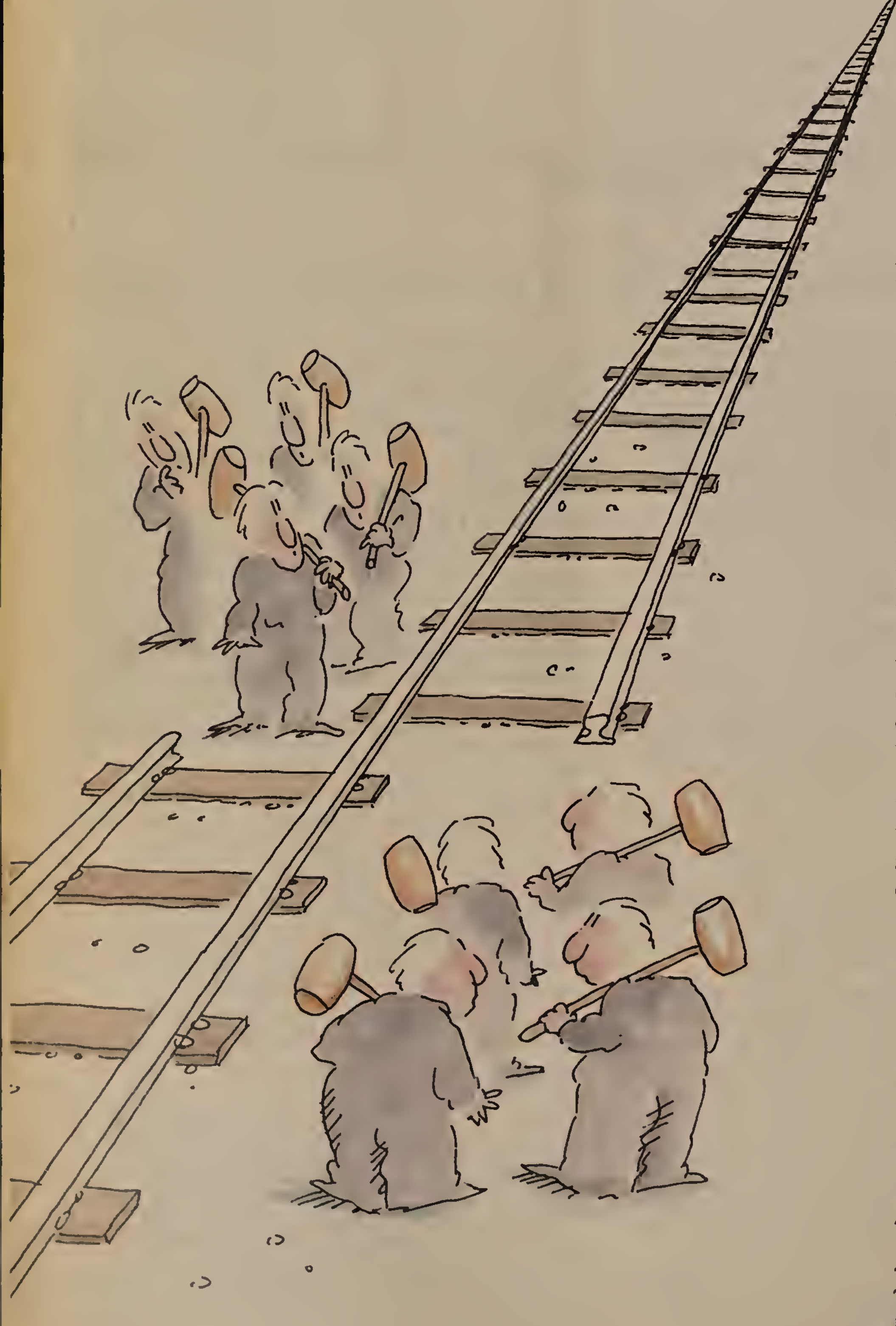
In addition, Interlan has taken an infusion of new management blood in the person of Steve Young, formerly product manager of Wang Laboratories, Inc.'s Wangnet, a packet-switching network. Each of these moves is calculated to bring the blush back to the bride's cheek.

D'Annunzio reflected on the change in company strategy, saying, "We want to move along with our customer base. For instance, they will probably see the wisdom of moving from TCP/IP to [International Standards Organization] protocols. We're already committed to facilitating that transition." From both inside and outside the company, the comments sound more sanguine.

Parenthetically, Micom has had its own identity crises in the past few years. The company has maintained a strong presence in some markets, particularly low-end statistical multiplexer, data PBX and asynchronous packet assembler/disassembler (PAD) products. But because most products are sold through distributor channels, Micom's Achilles' heel is that it is out of touch with its end-user market.

Consequently, a large portion of its user base migrated to more sophisticated solutions with other vendors, while Micom clung to its low-end product line. More recently, the company has decided to capitalize on its low-end expertise and efficient manufacturing capability by introducing the Micom Box line.

Box products, which include modems, asynchronous and synchronous PADs and packet switches, are modular and competitively priced, making them attractive to distributors and end users alike. Thus far, Micom has met with much critical acclaim for the Box line, which may be the start of something big for the company. ◘



WHEN IT COMES TO BUILDING WIDE-AREA NETWORKS, THERE'S NO SUBSTITUTE FOR EXPERIENCE.

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TELECOM TRENDS

> “We had some very bad experiences with long-distance carriers other than AT&T in the past. If AT&T’s Software-Defined Network hadn’t come along, we would have disbanded our AT&T [Enhanced Private Switched Communications Services] net and created some type of decentralized network from various Wats and 800 services.
>
> **George Lombardo**
> Vice-president of communications and chief operating officer
> Transamerica Information Services, an early SDN user
> Los Angeles

▶ CYBER DIGITAL

Hub unit bows

Controller lets users link firm’s MSX switches to support 40,000 lines.

BY JOHN DIX
Senior Editor

BOHEMIA, N.Y. — Cyber Digital, Inc., a private branch exchange manufacturer headquartered here, last week announced a hub controller that can be used to network the company’s 512-port MSX switches to achieve systems capable of supporting up to 40,000 lines.

The digital Cyber Hub Controller (C/Hub) is essentially a switch for switches, which, when fully configured, is nonblocking for 4,800 ports. Each of the 40,000 ports can support voice, data or a combination of both.

Owing to apparent marketing and distribution problems, Cyber Digital is little known within the PBX industry. But analysts applaud the company’s technology. “Cyber Digital is an engineering-driven company,” said Ian Angus, president of Angus TeleManagement Group, a consulting firm in Toronto. “It has a dynamite product based on a good architecture, but no marketing skills.”

The marketing shortcomings that have limited the company’s success in the small switch market will be a more severe handicap in the high-end market it is targeting with the C/Hub. “Who is going to buy a 40,000 line switch from a company that’s only sold about a dozen of its small MSX switches?” Angus asked.

But Cyber hopes the new technology and switch architecture will win some new converts. According to company President J.C. Chatpar, C/Hub is the first modular switch that can grow through the range Cyber supports. “The C/Hub provides a low-cost system that enables an organization to start with

See **C/Hub** page 14

Interexchange revenue forecast by traffic type
1985-1990

(Dollars in billions)	1985	1986	1987	1988	1989	1990
Message Toll service	38.73	41.06	43.52	46.13	48.9	51.83
Wats	12.04	13.37	14.87	16.47	18.07	19.88
Private lines Voice	4.07	4.29	4.59	4.78	5.15	5.89
Data	3.49	4.53	5.66	7.08	8.5	9.77
Other	.03	.04	.05	.06	.07	.08
Total Private Lines	7.59	8.86	10.3	11.92	13.72	15.74
Total Revenue Interexchange	59.36	63.29	68.69	74.52	80.69	87.45

Note: These figures reflect revenues for services only and do not take into account any access line charges paid by carriers for local access.

SOURCE: LINK RESOURCES CORP., NEW YORK

▶ BULK CALLING

Telpak more than just a memory in some states

BY JOHN DIX
Senior Editor

Although modern, high-capacity digital facilities provide the equivalent of AT&T’s now-defunct Telpak bulk private-line service, the old analog service still lives on in some state tariff books.

Telpak’s ghost was raised recently in conjunction with stories of how networking plans are being squeezed in petroleum-dependent states (“Texas steers net future,” *Network World*, July 7, and “Study: Florida net future dim,” *Network World*, July 28).

Texas, in particular, is trying to contend with the whipsaw effect of the oil glut and the expiration of an intrastate Telpak contract it has with AT&T. That contract expires Sept. 1, 1987.

Telpak is a grandfathered service in Texas, as it is in three of the six remaining states that carry the tariff. Telpak is not available to new customers where it is grandfathered, but current users can take advantage of the bulk discount private-line rate until their contracts expire. New York and Florida are the only states that still have an intrastate Telpak tariff.

Most of AT&T’s large customers were Telpak users when the company discontinued the service in the early 1980s. The service was dismantled because new services eradicated the cost differences that justified the Telpak discount, according to Karen Schwenk, district manager of state pricing and private lines for AT&T.

Telpak has been traditionally offered in four capacities: A, which was the equivalent of 12 voice-grade analog private lines; B, the equivalent of 24 lines; C, 60 lines; and D, equal to 240 private lines.

According to Schwenk, it is hard

See **Telpak** page 14

CROSS TALK
MICHAEL FAHEY

Private lines and privations

Pity the communications manager trying to optimize a large, nationwide communications network.

Since the beginning of the year, the Federal Communications Commission has approved seven private-line tariff increases by local exchange carriers. Moreover, two more increases are pending with the FCC, and industry sources say additional filings are expected before year end.

“It seems like two and three times a month, the local exchange carriers are filing changes with the FCC, and AT&T has no choice but to pass the additional costs on to us,” said Scott Sanger, a network analyst for Norwest Financial Information Services Group, a Des Moines, Iowa-based company. Norwest has a 4,000-drop communications network.

The rash of tariff increases means that the typical monthly per-drop price is now more than $120, a fee that has to be paid in addition to long-line charges, Sanger said.

In the not-so-distant past, users paid less than $40 per month per drop, in addition to long-distance costs. The bulk of the increased costs are the result of rising local exchange carrier access charges.

Now, Nynex Corp. has also filed a proposal with the FCC, which, if passed, would require private-line customers to bear a greater proportion of long-distance charges. The Nynex filings would also allow the Nynex operating companies to play a greater role in the billing process. Under the proposal, local exchange carriers would bill users directly for access charges, rather than passing the charges on to the long-distance carriers.

The local exchange carriers maintain that the increased special access charges are necessary to offset the revenues the carriers say they are losing because of local exchange bypass. They also say the costs of providing private-line service are rising.

Users groups and long-haul carriers, however, dispute the local exchange carriers’ claims. Some critics also claim that the Access Restructure Tariff filed by Nynex in June is an effort to move users away from private-line service and onto the switched network to create a captive customer base for future enhanced network services.

A decision by the FCC on the Access Restructure Tariff is scheduled for Sept. 24. The FCC will have to decide if Nynex is justified in placing a greater burden on private-line users. In making its decision, the FCC will have to evaluate Nynex’s contention that the increased reliance on private-line service by large users would force the carriers to place a greater financial burden on smaller business and residential users who remain on the switched net.

Before rendering its decision, the FCC would do well to bear in mind that the regional Bell operating companies’ stocks have recently been trading at record prices.

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▶ CARRIER COMBINATION

Argo, Litel, Microtel approve merger accord

Litel President McLernon named CEO.

BY BOB WALLACE
Senior Writer

NEW YORK — The Argo Group, Inc., Litel Telecommunications Corp. and Microtel, Inc. recently announced that all parties have approved a definitive merger agreement and will go ahead with plans to consolidate their businesses as subsidiaries of a newly formed corporation.

The fledgling company will operate a domestic and international all-digital telecommunications system comprised of fiber-optic and satellite commmunications links. The new company will be located in Boca Raton, Fla.

Officers for the new company include Chairman and Chief Executive Officer Lawrence McLernon, current president of Litel; President and Chief Operating Officer Dale Gregory, current president and chief executive officer of Microtel; Vice-President and General Counsel Ralph Polcari, current president and chief executive officer of Argo; and Chief Financial Officer Larry Wolfe, current senior vice-president of finance and administration of Litel.

The merger is subject to a stockholder vote and Federal Communications Commission approval.

Argo, based in New Rochelle, N.Y., operates a national, digital, satellite net and serves as an international carrier. Litel, based in Worthington, Ohio, and Microtel, in Boca Raton, both operate regional, digital, fiber-optic systems. ☐

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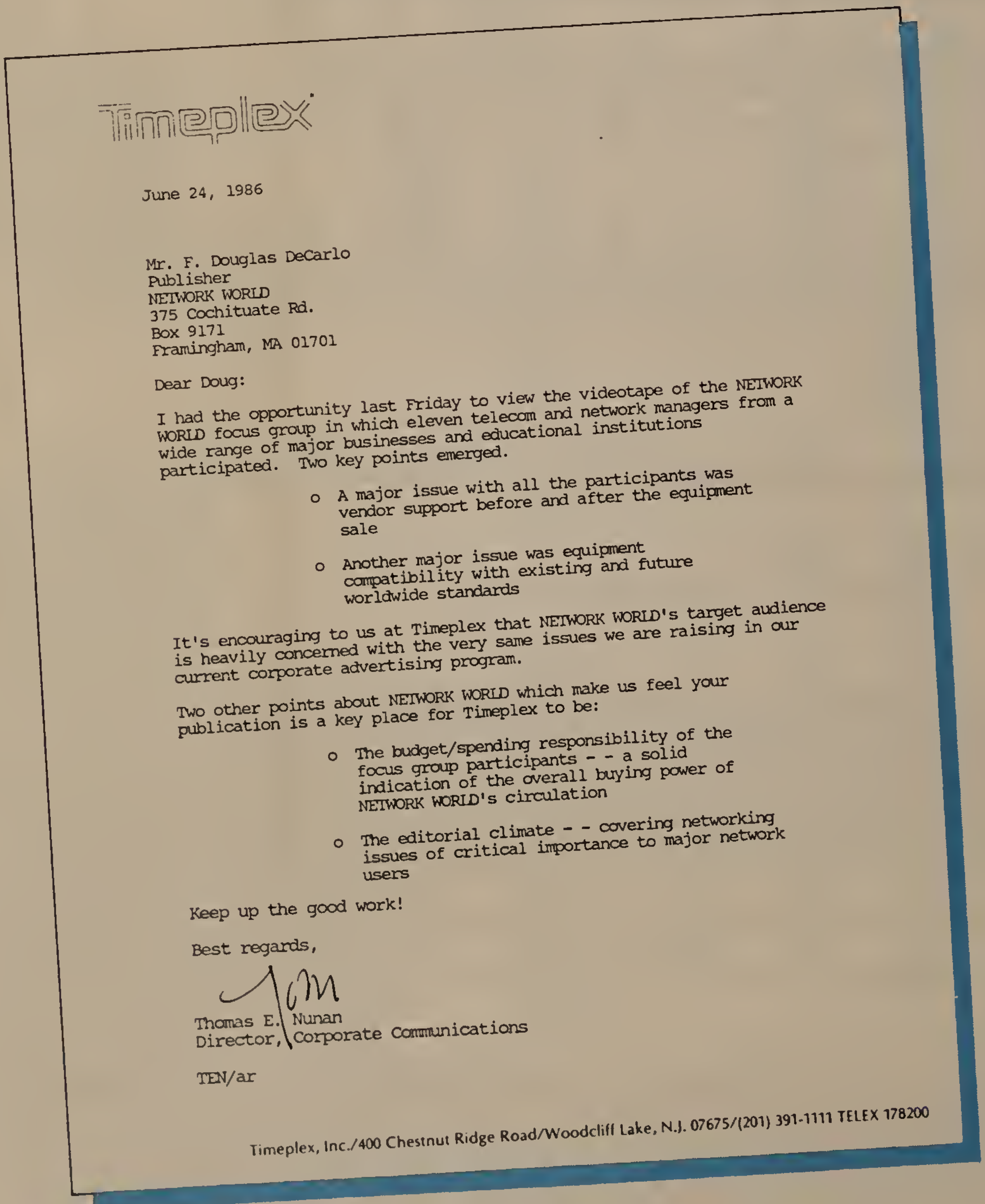

Timeplex

June 24, 1986

Mr. F. Douglas DeCarlo
Publisher
NETWORK WORLD
375 Cochituate Rd.
Box 9171
Framingham, MA 01701

Dear Doug:

I had the opportunity last Friday to view the videotape of the NETWORK WORLD focus group in which eleven telecom and network managers from a wide range of major businesses and educational institutions participated. Two key points emerged.

- A major issue with all the participants was vendor support before and after the equipment sale
- Another major issue was equipment compatibility with existing and future worldwide standards

It's encouraging to us at Timeplex that NETWORK WORLD's target audience is heavily concerned with the very same issues we are raising in our current corporate advertising program.

Two other points about NETWORK WORLD which make us feel your publication is a key place for Timeplex to be:

- The budget/spending responsibility of the focus group participants - - a solid indication of the overall buying power of NETWORK WORLD's circulation
- The editorial climate - - covering networking issues of critical importance to major network users

Keep up the good work!

Best regards,

TM

Thomas E. Nunan
Director, Corporate Communications

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C/Hub from **page 11**

a 512-port system and expand upward as the company grows," Chatpar said.

The C/Hub system integrates voice and data support at the handset and runs the multiplexed 256K bit/sec signal back to the switch over two twisted-pair wires.

Cyber calls its proprietary digital telephone sets Integrated Service Terminals. The sets house a coder/decoder that digitizes voice using industry standard Pulse Code Modulation (PCM) at 64K bit/sec, and supports RS-232, RS-449 or V.35 data interfaces. The digital telephones also serve a data packet assembler/disassembler (PAD) function to conforms to the CCITT's X.3, X.28 and X.29 standards for packet switching.

Chatpar said telephone sets are tied to the switch with a 256K bit/sec digital link that is divided into a 64K bit/sec voice channel, an 8K bit/sec data channel and an 8K bit/sec High-level Data Link Control loop control signal. The voice channel can also be used to support data at 56K bit/sec. He said all channels only account for 80K bit/sec of the link's 256K bit/sec throughput. Future sets will take advantage of the remaining bandwidth.

At the switch, the multiplexed 256K bit/sec link is broken down into its voice and data components and routed accordingly. Data is shuttled to the switch's internal X.25-based packet-switching bus and voice is handled by one of eight 4.09M bit/sec parallel PCM buses.

Chatpar said the proprietary digital telephones act as mini-front-end processors, enabling the system to support a range of data devices. In use, the PAD in the handset where the data call is originated will establish a link with a remote device and maintain the link until the call is completed.

In terms of voice, the C/Hub is said to support typical call-handling options and have integrated station message detail recording and built-in least-cost routing.

Chatpar claimed the price per port of the C/Hub is $200 a line for a voice-only configuration, $300 to $400 a line for data-only support, and $500 to $600 for integrated voice/data support.

Cyber Digital is located at 20 Floyd's Run, Bohemia, N.Y. 11716. ☐

Telpak from **page 11**

to gauge the crossover point where Telpak becomes more economical than standard private lines. Discounts vary by state and time and are hard to compare to the ever-changing rates for single leased lines.

Even in its heyday, Telpak's advantage was hard to gauge. "If you had longer circuits in some states, the break-even point would have been higher than if you had shorter circuits, and just the opposite in other states," she said.

Where available today, Telpak is typically sustained by the state public utility commissions, agencies of the local governments that have become so dependent on the old tariff. ☐

DATA DELIVERY

Racal-Milgo inks patent pact with RSA

Racal-Milgo, Inc., based in Sunrise, Fla., recently signed a patent license agreement with RSA Data Security, Inc., in Redwood City, Calif. RSA developed an encryption algorithm based on work completed at the Massachusetts Institute of Technology. The RSA algorithm will be integrated with Racal's Datacryptor 64 line of encryption products.

Hardware vendors' support of IBM's Disoss
Quarterly update

	Advanced Program-to-Program Communications	Physical Unit Type	Systems Network Architecture Distribution Services	Document Interchange Architecture	Final form text Document Content Architecture	Revisable form text Document Content Architecture
IBM						
Displaywriter	1	2.1	—	1 R	X	X
IBM PC	2	2.1	—	3 R	4	4
Series/1	X	2.1	15	15 R/S	15	—
System/36	X	2.1	5	5 R/S	6	6
System/38	X	2.1	X	X R/S	7	—
4700	—	—	—	8 —	8	8
5520	X	2.1	X	X R/S	X	X
Data General						
Eclipse Product Line	X	2.1	9	9 R	9	9
DEC						
VAX VMS Systems	X	2.0		10 R	11	11
Tandem						
Nonstop, II, TXP and EXT	12	2.0	—	— —	—	—
Hewlett-Packard						
3000 Series	—	—	—	— —	—	13
Wang						
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11. External Document Exchange
12. Snads/Advanced Program-to-Program Communications
13. Convert/DCA
14. Wang Office/Disoss Gateway
15. Series/1 Office Connect

SOURCE: COMMUNICATIONS SOLUTIONS, INC., SAN JOSE, CALIF.

DATA DIALOGUE

DONALD CZUBEK

IBM sculpts a standard for remote data access

An important issue in the design of distributed data processing systems is access to remote data files. Ideally, the location of these data files should be transparent to application programs and end users. So it shouldn't matter whether data is stored locally or at a remote site.

In June, IBM took a giant step toward creating an industry standard for this type of remote data access with its announcement of the Distributed Data Management (DDM) architecture. DDM is not a new IBM technology, for it has been available on the System/36 since last year. What is new is the fact that IBM has made DDM a formal architecture. This is important for several reasons. First, it means that IBM will be implementing DDM across its product lines; and second, it opens the door for implementation by other computer manufacturers because there is now a published specification.

DDM support has been announced for the System/36, System/38 and CICS. This means that data can be shared among applications running on all three products. For example, an application running on a System/36 may require access to a file that resides on a remote System/38. The location of the file is transparent to the application that issues the same I/O requests (Open, Close, Read, Write) it would use if the data was stored on a local file.

In our example, the application on the System/36 would issue an open request for the file's local name. The System/36 operating system with its inte-

See **DDM** page 16

Czubek is vice-president at Communications Solutions, Inc., a San Jose, Calif., communications software vendor.

▶NETWORKING

NSF spins a web of nets

Wide-area network to link U.S. supercomputer centers.

BY KARYL SCOTT
Washington, D.C. Correspondent

WASHINGTON, D.C. — The future is now at the National Science Foundation (NSF). Large corporations only now are beginning to deal with the problems of linking diverse corporate networks onto a single wide-area or metropolitan-area network. NSF is already implementing such a network.

NSFNet, which has been in the planning stages since 1984, is a collection of networks providing links between supercomputer centers located throughout the U.S. NSFNet ties together a number of networks used for research and development projects, such as the Department of Defense's Advanced Research Project Network (Arpanet). NSFNet was designed to provide a high-speed method for scientists and researchers to share research data collected at various institutions.

NSF-funded supercomputer facilities include the John von Neumann Center at Princeton University, the San Diego Supercomputer Center, the National Center for Supercomputer Applications at the University of Illinois, Purdue University, the University of Minnesota, Boeing Computer Services Co., AT&T Bell Laboratories and Colorado State University. The Office of Advanced Scientific Computing at NSF determined that networking was a fundamental component of the supercomputer initiative.

NSFNet is a hybrid network consisting of wide-area networks such as Arpanet, community networks connecting institutions working on similar research projects and state networks linking universities within a state.

In October 1985, the Defense Department signed an agreement with NSF to allow NSF supercomputer centers to use Arpanet as the communications medium that would tie together supercomputer centers around the country.

Computer Science Network (CSNet) is an earlier NSF network project initiated in 1974 to support collaboration among scientific researchers and allow resource sharing. It too is part of NSFNet. CSNet was designed as a logical network made up of 10 physical networks of varying power and performance. CSNet consisted of five major components: Arpanet; Phonenet, a telephone-based messaging relay service; X25Net, which provides support for Transmission Control Protocol/Internet Protocol (TCP/IP) over an X.25 public data network; a public host; and a name server, which keeps track of authorized system usage.

CSNet and Arpanet users can exchange electronic mail. CSNet has 165 members including universities and industry and government research centers around the country. Users pay membership fees ranging from $2,000 to $30,000, depending on the size of the member.

Bitnet, also a component of NSFNet, is a network linking various universities. Founded in 1981 by the City University of New York, Bitnet has grown to include 175 university members and connects more than 600 computers.

Another network connected to NSFNet is the Department of Energy's Magnetic Fusion Energy Researchers

See **NSFNet** page 16

DDM from **page 15**

grated DDM support would first attempt to find the file in the local disk directory. If the file is not found in the local directory, DDM searches the Network Resource Directory, which contains an entry for remote files that the System/36 users can access.

In this case, an entry in the Network Resource Directory would identify the remote System/38 that contains the required file, and DDM would send the required file open commands to the remote System/38 for processing. All subsequent I/O operations on the file would result in DDM commands being sent to the remote System/38 for processing.

It's important to note that DDM is a distributed file system, not a distributed data base technology. It gives the application several types of access to remote files, including sequential, direct access by record number and direct access by one or more keys. A distributed data base could be built using DDM.

DDM's support for these standard file types means that data can be shared across multiple types of products as long as the various products support one or more of the file models. This means, for example, that keyed direct access files could be shared across different IBM or other vendors' workstations even though the implementation of the file type is different on each machine. DDM provides the standard access protocol among the various products.

DDM clearly provides an important tool for the design of distributed DP systems, but there are limitations and drawbacks. In some instances, DDM would not be an appropriate design tool.

One of the key issues in the design of any system is performance. Remote data access by DDM across telecommunications facilities almost always will result in poorer performance than local data access. Therefore, DDM is most appropriate for accessing remote data that is not continuously accessed by the application. In cases where data will be accessed frequently, it's probably still best to perform a file transfer and then access the data locally. There are also situations where multiple copies of a file are not allowed. In this case, remote access may be the only answer.

While DDM remote file access is transparent to the users and application programs, it is not transparent to the system administrators involved. In fact, the burden of making DDM work falls squarely on their shoulders. It's the job of the system administrator to create and update the Network Resource Directories.

What is the future role of DDM in IBM networking? First, DDM support will spread into other IBM products. It is now supported by the System/36, System/38 and CICS on the mainframe. Other candidates include the Series/1, other mainframe software packages and the Personal Computer.

DDM will probably by adopted by other computer manufacturers such as Digital Equipment Corp., Data General Corp. and others competing in the departmental processor market. Since IBM has made DDM a formal architecture complete with published specifications, it will be easier for these vendors to be compatible with DDM. In short, IBM is setting yet another de facto standard for the industry.

NSFNet from **page 15**

Network (MFENet). Established in the mid-1970s to provide access to the Cray 1 supercomputer at the Lawrence Livermore National Laboratory in Los Angeles, MFENet uses dual satellite links at 11K bit/sec and 56K bit/sec and terrestrial lines at 56K bit/sec and 9.6K bit/sec.

The Space Plasma Analysis Network used by the National Aeronautics and Space Administration, the Merit Computer Network in Michigan and the New York State Education and Research Network are but a few of the other networks linked via NSFNet.

The first phase of NSFNet called for the creation of communications links. The backbone, which consists of a Digital Equipment Corp. PDP-11 running the Fuzzball communications software package and 56K bit/sec dedicated lines, recently came on-line with 12 people involved in testing and three remote users actually using NSFNet.

The goal of Phase 2 is to provide a high-speed network supporting T-1 speeds of 1.544M bit/sec and greater. Under Phase 2, researchers will investigate how to utilize and integrate a number of network topologies.

"In the strict sense, NSFNet will be merely a series of T-1 links. In the wider sense, it is a community of networks at research centers and universities around the country, linked by dedicated lines," said Stephen Wolff, program director for networking at the NSF Office for Advance Scientific Computing.

NSFNet employs the TCP/IP transport protocol, which is also the transport mechanism in Arpanet. Higher level protocols include File Transfer Protocol; Telnet, a remote logon protocol; and SMTP, an electronic mail protocol. Any network that supports TCP/IP can easily access NSFNet.

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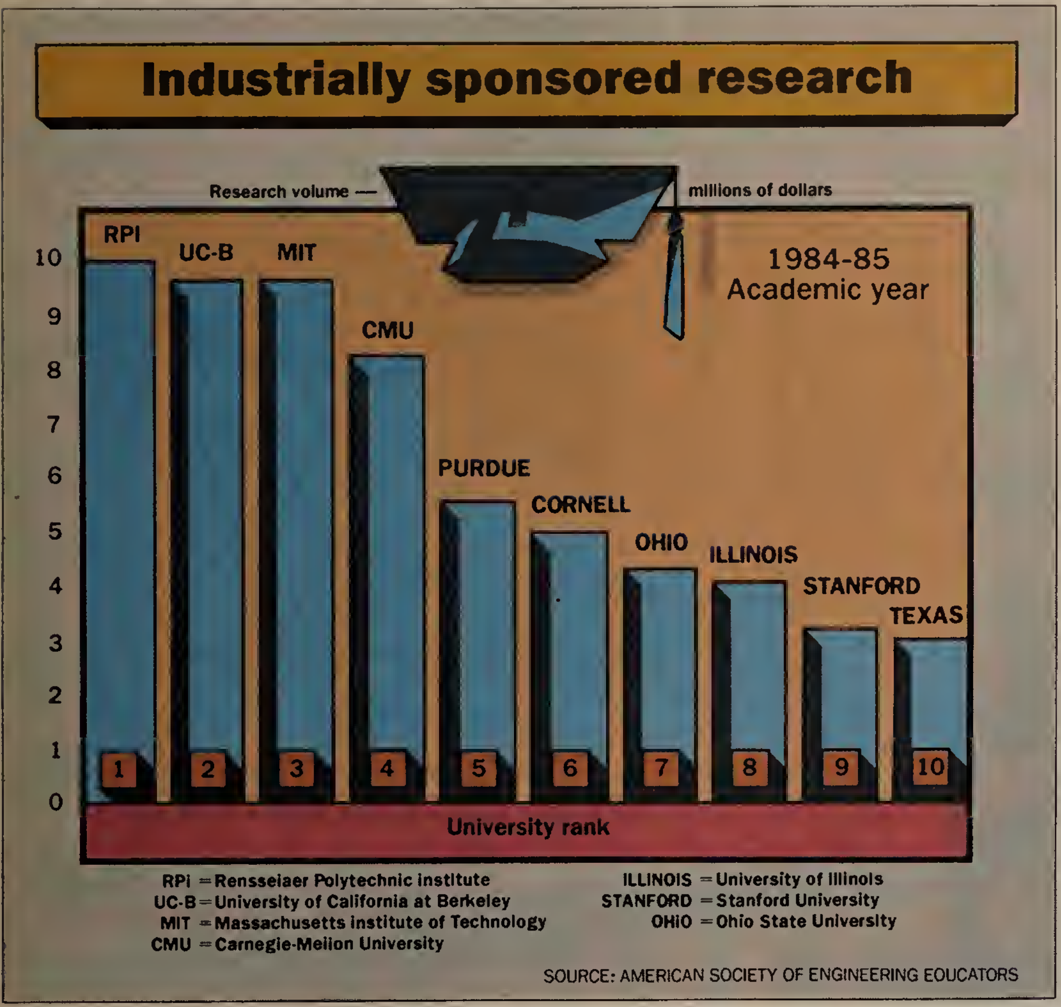
FACTORY COMMUNICATIONS

Auto plant use slips

A report recently released by the federal government claimed U.S. factories operated at only 78.2% of capacity in the month of July 1986. This marks the third straight decline and the lowest rate since 1983. In July, the report said, auto plant use slipped 3.4% to 76.1% of capacity.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▶ TECHNOLOGY OVERVIEW

Lowdown on factory nets

Pros and cons of plant-floor nets.

BY RAJ MELVILLE AND GEORGE KOSHY
Special to Network World

The popularity of broadband Manufacturing Automation Protocol-based factory networks has increased markedly since the Autofact '85 conference and exposition last November. Thousands attending the mammoth factory automation show marveled at the operation of the huge MAP-based network exhibition.

Few large manufacturers, however, are currently installing this type of network. Users such as Ford Motor Co. have already begun to install broadband, coaxial cable local nets in their factories. But many users are currently operating baseband local nets in their plants.

The factory networker should first examine the advantages and disadvantages associated with each factory local net before choosing a system for use on his or her

See **Broadband** page 20

Melville and Koshy are associates with Booz, Allen & Hamilton, Inc. in Lexington, Mass.

INCIDENTALS

All those wishing to attend, but not yet registered for, the MAP/TOP Users Group meeting in Ann Arbor, Mich., on Sept. 15 and 16 should contact the Society of Manufacturing Engineers (SME) at (313) 271-1500 for last-minute registration information.

* * *

SME is sponsoring a conference that focuses entirely on the Manufacturing Automation Protocol. "The Manufacturing Automation Protocol Conference," will be held at the Hyatt Regency Hotel in Long Beach, Calif., on Sept. 22 to 24. The conference keynote speech will be delivered by Daniel Shunk of Arizona State University. Those wishing to attend this conference should contact Ann York of SME Technical Activities Division at (313) 271-1500 ext. 369.

* * *

"Barcoding: Data Acquisition Comes of Age," will be held Oct. 8 at the Bayside Exposition Center in Boston, and on Oct. 22 at the Memphis Convention Center in Memphis, Tenn. The conference is sponsored by SME. For additional information on the two shows, contact Darcy Clift-Coon of SME at (313) 271-1500, ext. 375.

* * *

The next MAP Technical Review Committee meeting will be held on Sept. 16 in Warren, Mich. For additional information, contact Tom Brushaber of General Motors Corp. at (313) 456-2234.

FACTORY FACTS

BOB WALLACE

GM's MAP flap fuels user skepticism

All's quiet on the automation front.

A lengthy piece detailing difficulties encountered introducing Manufacturing Automation Protocol technology to the factory floor of General Motors Corp.'s Detroit/Hamtramck plant was printed in *The Wall Street Journal* prior to the MAP/TOP Users Group meeting in Seattle. As could be expected, the story caused a rather large stir among members of the users group that, like GM, are investing millions of dollars in factory automation projects.

GM reacted poorly to the situation. At the users meeting, GM detailed its three-plant Truck and Bus MAP project but refused to elaborate on the mammoth project for the trade press and prohibited the inclusion of the presentation in the printed version of the minutes.

GM obviously wanted to prove to users that MAP and factory automation are alive and well and functioning within several GM plants. But by refusing to share its network implementation experience with the meeting's 700 attendees, it appears to have done irreparable damage to the factory automation industry.

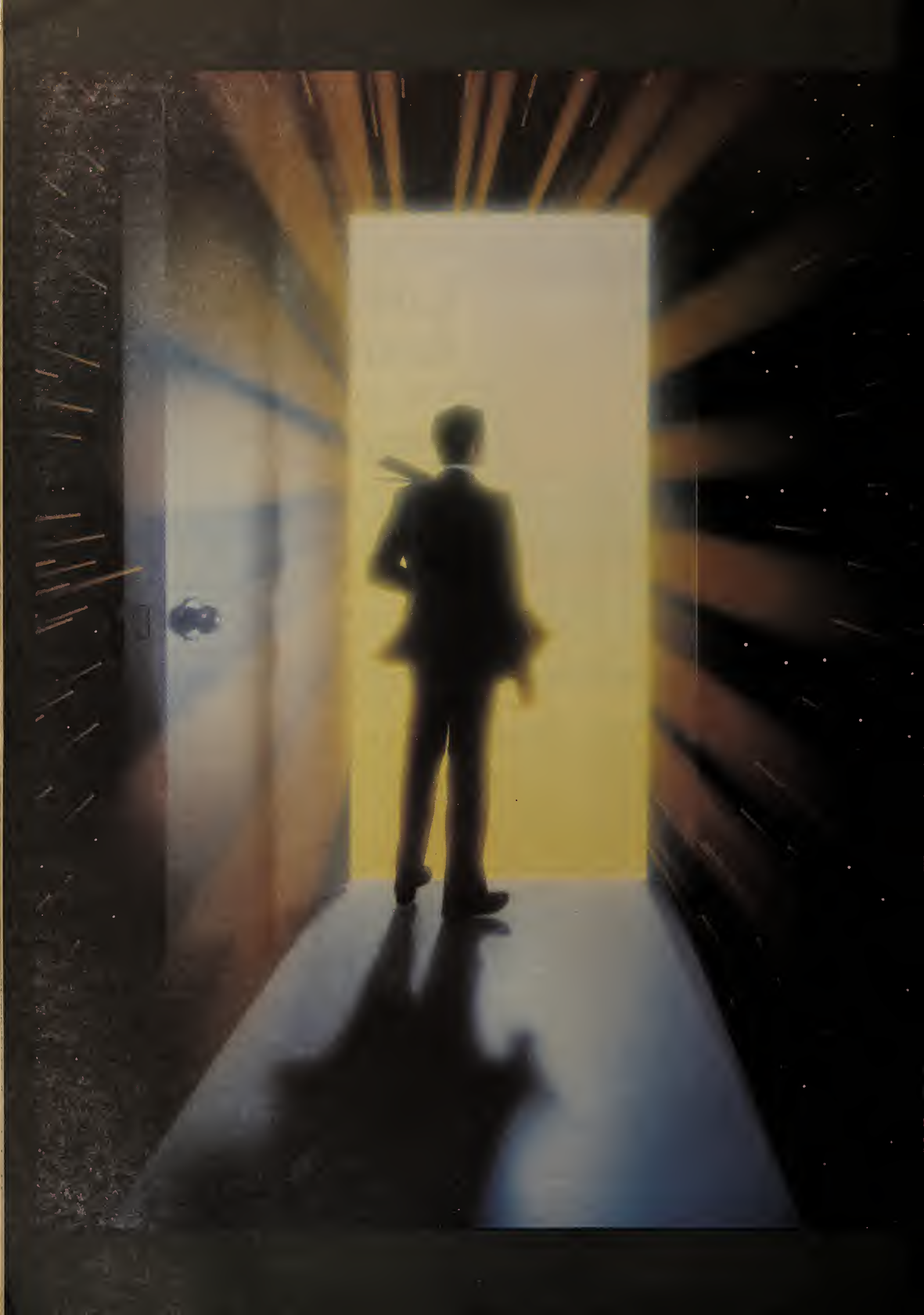
If GM, the nation's largest automaker and the prime mover behind the MAP movement, is encountering difficulties with the technology, why would smaller users want to further pursue factory automation projects? The silence itself may have caused manufacturers to reassess their planned factory automation projects.

> *"GM wanted to prove that MAP and factory automation are alive and well."*

One New York tabloid recently ran a news brief that said the automaker was planning to scrap its Saturn plant in Tennessee. GM denied it. Rumors that GM's GM10 MAP project has radically been scaled down have been circulating for weeks, without GM response.

Through its silence on many manufacturing issues and projects, GM has inadvertently acted as a catalyst for the development of numerous bad news rumors. GM has already admitted its Saginaw, Mich., Steering plant is already 60 days behind schedule. GM claimed the Truck and Bus plants would be open for inspection by the media in July. What has really become of the MAP pride and joy of the automakers?

To worsen matters, users read of massive layoffs in the robot industry and hard times suffered by computer-aided design and manufacturing product vendors. Now users hear of how manufacturers may be affected by the impending loss of the investment tax credit. User concern about the well-being of these factory automation markets is growing. GM would be well-advised to diffuse the issue by being candid about its various automation projects with both users and vendors. Failure to tackle the problem before it grows larger may serve to increase user and vendor skepticism about the practicality and feasibility of using advanced manufacturing technology today.



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▶MANUFACTURING AUTOMATION

Bechtel, Japanese firms target factory systems

BY BOB WALLACE
Senior Writer

SAN FRANCISCO — Bechtel National, Inc., a large conglomerate based here, recently joined forces with three Japanese companies to enter the Japanese, European and U.S. factory automation markets.

Bechtel spokeswoman Vickie O'Giela said Bechtel and Toyo Engineering Corp., Toyoda Machine Works Ltd. and Sumtimo Electronics Industries, all of Japan, will explore the possibility of constructing fully automated factories.

She maintained, however, that the joining of forces would not be used to promote the export of factory automation products from either the U.S. or Japan.

In addition, O'Giela said that the conglomerate expects to contract rapidly for the construction of fully automated automobile factories in the U.S.

Broadband from **page 17**

company's plant floor. Network access methods, difficulty of network implementation, cost of components, maximum area of coverage and transmission media flexibility are the most important network features to be considered.

The following is a rundown of some factory network possibilities:

Baseband, carrier sense multiple access with collision detection (CSMA/CD), coaxial cable, bus topology (IEEE 802.3) — This local-area networking scheme is based on Ethernet-type local nets. It supports a maximum transmission speed of 10M bit/sec. This type of network can reach a maximum length of 1,500 meters. The maximum length and certain other restrictions of this scheme make it difficult for the network to cover large areas, such as an entire factory floor.

The CSMA/CD access method limits the maximum attainable throughput to roughly 40% of the transmission speed, or 4M bit/sec. These nets are easily installed.

Broadband CSMA/CD, coaxial cable, bus topology (Broadband IEEE 802.3) — The advantage of this local net over baseband bus local-area networks is that it can cover longer distances and offers the features of broadband signaling technique. The most important of these features is the ability to simultaneously operate multiple networks over different radio frequency channels on a single coaxial cable.

Disadvantages of broadband nets using CSMA/CD include network complexity and high cost of installation of the coaxial cable.

Baseband, token-passing, coaxial cable, bus topology (IEEE 802.4) — This type of local net provides the advantages of the token-passing network access technique and the theoretical ability to cover unrestricted distances on a factory floor. The major disadvantage of baseband token-passing networks is that the token-passing algorithm is much more difficult to implement than contention-based access methods such as CSMA/CD.

Broadband, token-passing, coaxial cable, bus topology (IEEE 802.4) — This network specification was adopted as the first of the seven layers of General Motors Corp.'s MAP. Factory networkers can calculate the maximum amount of time a single network node would wait to gain access to the token-passing network. This capability is not available with nets that implement the CSMA/CD network access method. Implementing broadband token-passing nets is far more expensive and requires more engineering expertise than implementing baseband, token-passing nets.

Baseband, token-passing, twisted-pair, ring topology (IEEE 802.5) — This scheme, incorporated by IBM in its cabling system, is designed to enable users to create the factory network with existing twisted-pair wiring. Like all token-passing networks, this type of net provides better throughput than contention-based networks using CSMA/CD. The wiring plan and the network access algorithms take into account the inherent unreliability of the ring technology.

Baseband, token-passing, fiber, ring topology (American National Standards Institute X3T9.5) — This local-area networking plan differs from other designs in that it uses fiber-optic cable rather than coaxial cable or twisted-pair wire. In addition to offering the advantages of token-passing technology, this type of local net is impervious to electromagnetic interference.

These optical cable-type nets boast a throughput of roughly 100M bit/sec. The main disadvantage associated with fiber-based nets is the cost of the fiber-optic cable itself.

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COMMUNICATIONS MANAGER

Microwave mart up

The domestic market for short-haul microwave equipment was $53 million in 1984 and is forecast to grow to $131 million by 1988, according to Dataquest, a San Jose, Calif.-based market research firm.

NETWORK SERVICES

Selling disaster relief

Premiere building nationwide net to help users in an emergency.

BY MARGIE SEMILOF
Senior Writer

While mainframe hot sites, or backup facilities, have long been the focus of the traditional disaster recovery business, Leo Wrobel, president of Premiere Network Services, Inc., thinks communications backup is actually the key to speedy recovery of lost data.

The former network engineering manager for Lomas & Nettleton Financial Corp., a Dallas-based mortgage company, is building a national network designed to relocate data centers and restore on-line networks in less than 24 hours. The service will provide a bulk transmission facility to users that may otherwise have to rely on hundreds of expensive, dial-up lines provided by a common carrier.

Wrobel's company derives its cost-cutting edge by locating each of its switching centers within one-quarter of a mile from an AT&T or Bell operating company office to cut down on line costs.

Clients will be connected to Premiere sites via either a 192-channel, 45M bit/sec fiber-optic cable, a digital microwave system or a T-1 carrier. Users will require their own multiplexing equipment to connect with the T-1 facility. Each Premiere location will offer shell site services with raised floor space, emergency power and emergency T-1 facilities to at least 30 U.S. cities.

Once users are hooked to a Premiere location, they will also be able to opt for connections to remote locations via AT&T or BOC circuits. Wrobel said Premiere's leverage as a potential local loop bypass company will help him get lower rates from BOCs for fiber-optic links.

Users will also get lower transmission rates by choosing another long-distance company provided by Premiere through Quest Corp. Quest is a digital microwave reseller that sells bulk services to companies such as MCI Communications Corp., American Satellite and US Telecom, Inc.

Although Premiere is currently set up in only 30 cities, users can still use the service to connect with any U.S. city, "but they wouldn't be able to get the cost break from using our bulk reseller service," he said.

At this time, users must provide their own hot site facilities. Wrobel said he is negotiating with several hot site vendors to add the service as a complement to Premiere's product line.

Wrobel said Premiere targets companies with extensive on-line networks, such as banks, airlines and government agencies. Most companies now rely on dial backup for disaster recovery, a plan he said is inefficient as well as expensive for companies with multiple circuits.

"Dial back-up is fine for a company with 15 circuits," he said. "If a company tried to back up a 100-circuit network, it would need 200 phones and 400 dial-up modems. You would also have to hope your client knew how to connect the modems. Usage charges for a 100-circuit, dial-up network can cost about $100,000 per day."

At least two users considering Premiere for their networks are enthusiastic about the potential for a communications-intensive disaster recovery plan.

"It is hard to evaluate the importance of disaster recovery," said Phil Evans, director of telecommunications for Chicago-based FMC Corp., "because it is difficult to quantify the value of a lost data center. Everyone knows it is valuable. That's the reason there has been so much emphasis on disaster recovery and security.

"[Premiere] is certainly a logical and reasonable method of data recovery," he added. "Using high bandwidth facilities to transmit into our off-site center means we can process more data and have a more rapid recovery time."

Newton Terry, disaster recovery manager for Kansas City, Mo.-based Zale Corp., said that most current off-site disaster recovery methods focus on restarting a company's batch processing function rather than considering the method of communications from the home site to a remote location.

"A company as large as ours is heavily dependent on communications," he said. "It is also the hardest thing to do. If you cannot pull data out of the stores, it cannot be processed."

Terry, who is also author of *Computer Disaster and Recovery Planning*, said although there is no significant change in the overall disaster recovery market in terms of user requirements, the recovery of telecommunications functions is overlooked by most disaster recovery product vendors.

"The data center can be effectively restored with off-the-shelf items through a variety of companies," he said. "But communications often takes a back seat in recovery planning. Unfortunately, it is often the last thing communications managers think of."

GUIDELINES

MARGIE SEMILOF

Advice from across the fence

Misunderstandings that crop up during any stage of the buyer/seller relationship can strain any happy vendor and user relationship. Users blame the difficulty on either crummy products or lousy vendor sales and maintenance crews.

Vendors ramble on about users with insufficient knowledge of communications equipment, claiming that some communications managers lack knowledge of the basic networking principals.

Equal time for vendors

When it comes to these topics, *Network World* usually examines various user problems and strategies. However, in the interest of equal time, this week we let vendors voice a few pet peeves. Their suggestions are intended to serve as constructive advice to users.

- Stay on top of your company's long-range planning strategy. Vendors complain that, despite all the publicity about long-term strategic network planning, users still order products to satisfy needs for the next six months.

There is no question that users can get better pricing by buying in bulk and can save their company a lot of money by ordering a product with enough capacity to last a long time.

- Users can also end up buying the wrong gear by not giving data communications equipment planning the same time and thought as data processing equipment planning. Users have to take their time to plan communications networks and then take vendor lead times seriously. Many vendors don't stock vast amounts of inventory, and in some cases, they build products to order.
- Users must understand the capabilities of a network and that it is a transport method — not a magic device. Vendors claim that some users are literally looking for products to solve all foreseeable problems.

As one vendor sales representative said, "The idea of having one product that will solve all business requirements is totally unrealistic, given the rapid changes happening within the industry, not to mention the changes happening within the user's company."

- Vendors encourage customers to take advantage of their users groups. Not only do these organizations help the vendor get a better picture of what is going on in the user community, they help the user exchange ideas with other users and give the vendors ideas for future product enhancements.
- Keep a log to record all network changes, such as added lines or new software or any troubleshooting steps already taken by the user. It saves the vendor a lot of time before a service call.
- Recognize that beta testing helps the vendor identify problems so the general release of a product is troublefree. Users should understand that, by agreeing to be a beta test, they are undertaking a cooperative venture. This is not just an early release of a product.
- Finally, make an effort to understand the structure of the vendor organization.

If there is a problem with a piece of equipment, you may get it fixed faster if you contact customer service — not the sales staff.

To the 23,757 *Network World* subscriber applicants:

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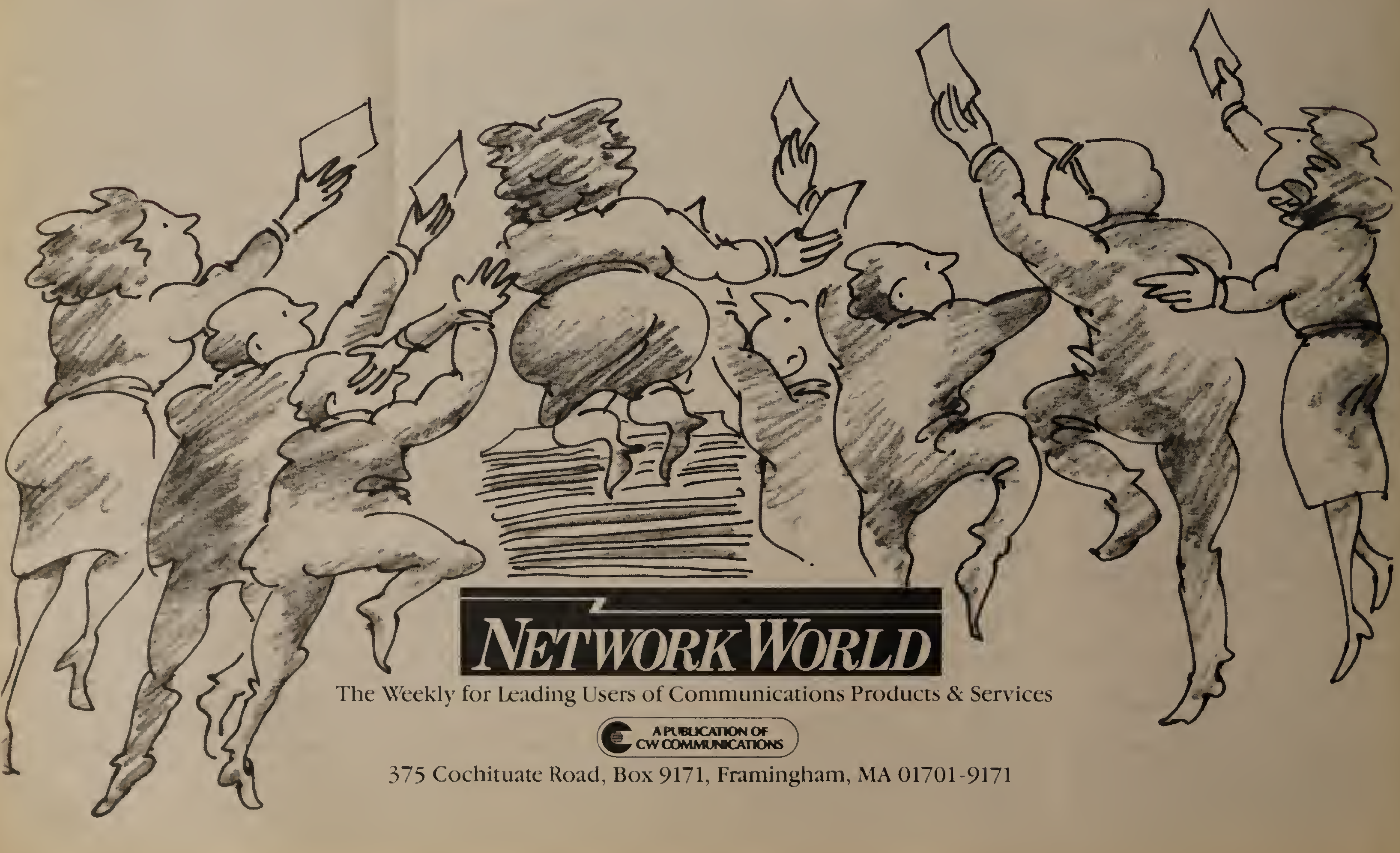
Please don't send us duplicate subscription forms—this just slows down the qualification process. Thanks!



NETWORK WORLD

The Weekly for Leading Users of Communications Products & Services

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WHY
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US SPRINT™ FIBER OPTICS. BUILDING ALONG CLEARLY SUPERIOR LINES.

Over the past decade the telecommunications industry has undergone a revolution. It's all due to a dramatic new transmission technology: digital fiber optics.

It is clear that leadership in the field of telecommunications will depend on mastering this new technology. US Sprint has...by committing three billion dollars to the task.

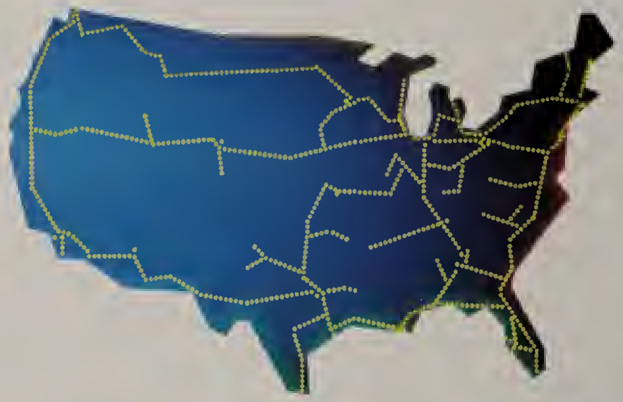
Today, US Sprint has the world's longest fiber optic cable system in the ground; longer than MCI's and more than twice as long as AT&T's. Soon we will have the first border-to-border 100% fiber optic network in place. By the end of 1987, virtually every call placed on US Sprint will travel over the fiber optic network.

Fiber optic transmission is clearly superior to any other technology. Analog microwave, even digital microwave and satellite transmission are all susceptible to various forms of disruption, from thunderstorms to hot weather; even ionization caused by sunspots. Fiber optics has eliminated all of these kinds of interference.

How does it work?

Fiber optic technology transmits signals by first "digitizing" them and then sending them down pure light-conducting fiber as thin as a human hair. These "zeroes and ones" of light are generated by a miniature laser that pulses 565 million times a second.

Yes, you read that right.



US Sprint's coast to coast fiber optic network, scheduled for completion 12/87.

Because every transmission is converted to this digital code, messages or data can be reproduced at the receiving end with stunning clarity. Noise, hiss and static have been virtually eliminated. Independent tests have proven that, on their very first call, three out of five business people preferred the clarity of US Sprint fiber optic transmission over AT&T's standard lines.

In another test, incredibly, 94 out of 100 people actually heard a pin drop over a 799 mile US Sprint fiber optic connection.

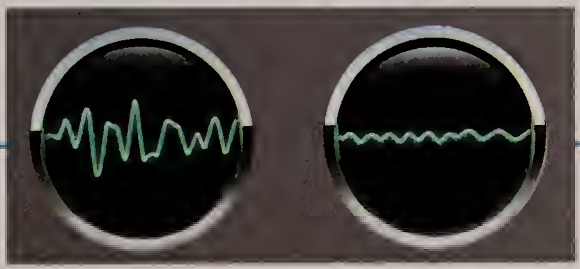
Any data can be transmitted: voice, computer data, even images for video teleconferencing. And fiber transmission capacity is just as surprising. It can take up to 16,000 separate copper wires to carry the same volume as one fiber optic cable pair on the US Sprint network. When completed, US Sprint's network will be virtually 100% redundant, allowing for almost instant rerouting around trouble areas. That's dependability.

Why is it right for your business?

The answer is simple: quality, security, control and low cost.

1. Quality. Because your voice or data will be transmitted digitally utilizing fiber optic technology, the problems of old "analog" transmission simply do not apply. Noise, hiss, and fading out are virtually eliminated. And, fiber optic cable is nearly impossible to tap. So, your important data is protected.

These oscilloscopes compare the noise of conventional analog transmission and the quiet of digital fiber optics.



THREE OUT OF FIVE BUSINESS PEOPLE PREFER US SPRINT FIBER OPTIC CONNECTIONS.

2. Control. Because many of US Sprint's advanced services are software defined, you can control your own network. This gives you the flexibility to fit your business needs exactly.
3. Low cost. The overall quality, architecture and advanced technology of digital fiber optics makes transmission so dependable that it costs us less to maintain. That can mean lower costs to you, the user.

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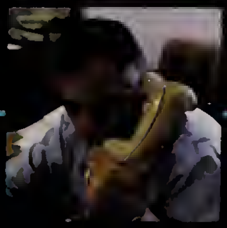
Whether you're designing a private network for major regional centers, or multiple remote locations, US Sprint lets you link your dedicated facilities with our VPN.℠ And whenever your needs or locations change, you can easily reshape your network.

In addition, US Sprint's fiber optic network will provide points of presence in all major U.S. business centers. That means lower costs and lower traffic requirements to justify network access for remote locations.



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No matter what computer network your business depends on, Telenet can make the connection.

Telenet has proven ability to apply network technology to solve business problems: using public or private networks or combinations of the two to improve inventory control, speed retail transactions and reduce the cycle of business messaging from days to seconds. On the Telenet public network alone, businesses solve information-based problems half a million times a day throughout 70 countries. Telenet has already engineered over 60 customized international networks.

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Right now, when you sign up for most US Sprint business services, you'll get an extra bonus discount of 10% on that new service for a full 12 months. What's more, this bonus discount is on top of US Sprint's new low prices that are lower than AT&T or MCI. Call your US Sprint Account Executive for details. Offer expires September 30th, 1986.

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While standard analog transmission uses the same technology as this 45 rpm record, fiber optics uses the same digital technology of this new compact disc.

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▶COMMUNICATIONS SOFTWARE

VAX E-mail tool debuts

IBM PC version of Messagenet slated for next year.

BY NADINE WANDZILAK
Staff Writer

NASHVILLE — Neither rain nor sleet nor snow nor dark of night will block electronic mail from its appointed rounds. A new software package from S&H Computer Systems, Inc. purports to make E-mail easier to use by automating mail-handling procedures.

S&H's Messagenet manages the transmission, routing, receipt and filing of internal and external electronic mail messages and data. The software is now available for Digital Equipment Corp. VAX systems. An IBM Personal Computer version is scheduled to be available in the first quarter of next year.

With Messagenet, users can also exchange telexes, mailgrams, cablegrams and other messages with anyone who can access Western Union Corp.'s Easylink or MCI Communications Corp.'s MCI Mail. They can receive messages via telex, mailgram, telegram, international cablegram, computer letter service, overseas priority letter and postal mail.

The menu-driven software features personal and public address books, a VAX editor to create and modify message text, a filing system, an internal memo system and a direct computer-to-computer file transfer system for both Ascii and binary data. A template will format information for whatever type of mail a user chooses to send.

> *"S&H's Messagenet manages the transmission, routing, receipt and filing of E-mail messages."*

Users can decide when their mail should be sent — as high or low priority — as soon as possible or at a specific time. Coast-to-coast and international messages are scheduled for evening and night runs, when phone rates are lower. Specified users can send priority messages immediately. All users receive Messagenet access codes. Messagenet also computes the estimated cost to send an electronic mail message. The program will produce a cost estimate at any point in a message, based on the number of characters in the message and how it is being sent.

Electronic mail is gaining slow acceptance, despite its many conveniences, according to Richard Dohrmann, S&H vice-president of sales and marketing. Transmission services such as MCI or Easylink aren't enough in themselves to attract users, he said.

Messagenet will foster users' acceptance of E-mail, Dohrmann said, because the program and not the user performs the mailing chores.

The price of Messagenet ranges from $2,000 for a MicroVAX II to $6,000 for a VAX 8600.

▶SOFTWARE

Macintosh-to-Wang VS link unveiled

Omnigate-tailored Mac-to-IBM PC link package supports data conversion.

BY JIM BROWN
New Products Editor

SAN FRANCISCO — A two-piece software package linking Apple Computer, Inc.'s Macintosh personal computer to Wang Laboratories, Inc.'s VS line of minicomputers was recently released by Omnigate, Inc.

The package consists of a software module added to existing Omnigate Allegroserver software residing on Wang VS minicomputers. The Allegroserver package supports asynchronous access into Wang VS document management and creation functions, data file functions and Wang VS Office electronic mail.

The software module was developed by Dataviz, Inc., in Norwalk, Conn. Dataviz modified its Maclink Plus Macintosh-to-IBM Personal Computer communications package so that it links a Macintosh to Allegroserver. The modified Maclink Plus also supports file transfer and data format conversion.

Allegroserver converts any text file received from any personal computer to a revisable Wang VS document. It also supports file transfers to connected devices over the Xmodem protocol.

"The handshake between the Apple Mac and the Wang VS is a proprietary link. We're modifying protocols in order to have a module on the VS side that shakes hands with the Mac," said Dwight Holmberg, president of Omnigate. Once established, the link allows Macintosh users to request files stored on the Wang VS through the Macintosh user interface.

The Maclink Plus package transmits the request, and the Allegroserver/Maclink module converts it to Wang VS form. The file is downloaded to the Macintosh at up to 19.2K bit/sec. The Maclink Plus package then converts the Wang VS format into a form usable on the Macintosh.

In addition to word processing documents, the package supports transfer of Lotus Development Corp. 1-2-3-type spreadsheets to the Macintosh, which then converts the data for use in Microsoft Corp. Excel or Lotus Jazz spreadsheets. It also allows Macintosh files to be stored on Wang VS-supported storage units.

The Maclink Plus package will also convert Macwrite word processing documents to conform to IBM's Document Content Architecture. The converted file can be stored on the Wang VS for subsequent retrieval from a connected IBM Personal Computer.

The offering is going into beta test this month, Holmberg said. A production version will reportedly be available for distribution in late September. An Allegroserver module linking the Macintosh to Wang OIS systems is planned for release later this year.

Holmberg also said his firm has a contract to provide a Bell operating company with a Data General Corp. CEO Mail-to-Wang VS Office electronic mail bridge. He added that the firm will work to integrate Digital Equipment Corp.'s All-In-1 Mail with Wang Office Mail.

The Allegroserver/Maclink module will list for $2,000, and an Allegroserver-compatible Maclink Plus package will list for $250 for each Macintosh. Allegroserver software ranges in price from $3,000 to $15,000, depending on the Wang VS configuration.

▶HEWLETT-PACKARD

HP releases software wave for minis and PCs

Packages append E-mail, file transfer.

PALO ALTO, Calif. — Hewlett-Packard Co. recently released a wave of office automation software for its HP 3000 Series of minicomputers and its personal computer line.

The firm enhanced its Personal Productivity Center package with the release of HP Deskmanager Version B and added HP File/Library and HP Schedule options for the Deskmanager package. The firm also announced HP Advancemail, which ties its Vectra, Touchscreen and Portable Plus personal computer users to Deskmanager users.

HP Deskmanager Version B adds spreadsheet and data processing applications to existing electronic mail, word processing, electronic filing and time-management applications. The upgraded release also employs a transparent file conversion capability that supports exchange of data between different applications.

HP said the enhanced Deskmanager links to IBM's office systems running Professional Office System. Another function added to the Deskmanager is what HP calls forms-processing. The company says a user creates a form on Vplus/3000 software and then distributes it through Deskmanager electronic mail. Recipients fill in the form and send it back to a central site where it is collected and forwarded to its destination.

> *“The HP File/ Library package runs in conjunction with the Deskmanager and creates a community filing and archival document library.”*

The upgrade also includes a suspend-and-resume facility, which allows users to suspend a work application, access a file field to retrieve information and return to the work application at the point it was left.

The facility also allows users to suspend an application to access and complete a telephone message screen and then return to the application at the point at which it was left.

The HP File/Library package runs in conjunction with the Deskmanager and creates a community filing and archival document library. The package creates catalogs that index documents and files held in or out of the Deskmanager. It also supports shared access to the documents and files, archives infrequently used documents and files to magnetic tape and supports three levels of access security.

Also working as an option under Deskmanager is the HP Schedule package. The package collects data from an individual's electronic calendar and compiles the information in a central location. The package automatically reports when an individual has been scheduled to appear at meetings that occur simultaneously.

The HP Advancemail package resides on HP's or IBM's personal computer lines. It supports electronic mail and file transfer between a personal computer and a terminal-based Deskmanager user. The package relieves the HP 3000 Series host from driving electronic mail and file access features and allows the personal computer user to retain local control.

Pricing

Prices for the recently released software vary, depending on which HP 3000 Series model it will be supported by. HP Deskmanager Version B prices range from $4,800 to $12,000. The HP File/Library package ranges from $2,800 to $7,000. The HP Schedule package ranges from $1,200 to $3,000. The HP Advancemail package for the HP Vectra and Touchscreen and the IBM Personal Computer is priced at $395, while the price for an HP Advancemail package for the HP Portable Plus is $495.

All
T1 networks
save you money
when
they're *up.*

PRODUCTS & SERVICES

VAX-to-IBM software enhanced

Joiner Associates, Inc. released software that supports communications between Digital Equipment Corp. VAX/VMS computers and IBM/VM computers.

Jnet Version 3.0 resides on a DEC VAX running under VMS operating system Release 4.0 and emulates IBM's remote spooling communications subsystem networking protocol in IBM store-and-forward networks. Features added in Jnet Version 3.0 include a shared router that reportedly conserves memory; a full-screen network monitor that displays network traffic, link and server configurations, CPU use and network costs; support for printing various data formats; support for network commands to list or delete print queues; and IBM-to-VAX Cluster file transfers.

Jnet pricing ranges from $6,000 to $19,500, depending on the DEC VAX model.

Joiner Associates, Inc., P.O. Box 5445, 3800 Regent St., Madison, Wis. 53705 (608) 238-8637.

Data and voice test option

Tekelec, Inc. added a data and voice testing option for its TE820A test system for DS1 interfaces to T-1 networks.

Tekelec's board-based **Quasi Random Signal Source option** allows users to transmit known patterns through the DS1 equipment and compare the received pattern with the original. If errors have been introduced, the equipment will supply a bit-error count that is displayed as either an error rate, individual errors or errored seconds.

The test signal will also generate customer service unit loop-back and unloop codes to locate specific problem areas in a DS1 network.

The QRSS option plug-in card costs $1,500.

Telelec, Inc., 26540 Agoura Road, Calabasas, Calif. 91302 (818) 880-5656.

Modem network monitoring set

A personal computer-based modem network monitoring package was recently introduced by **Communication Devices, Inc. (CDI).**

The **Network Windows** software requires use of a personal computer with a color monitor. It extracts and displays information collected by CDI's Modem Use Monitor, which monitors any combination of up to 64 autoanswer, leased-line or direct-dial modems. Each monitored modem's usage and performance status is displayed on the package's color-coded, on-line activity screen. Blinking color status lines indicate modems with operational problems.

The package's on-line problem screen reports the time, date, type of operational error and its duration. Error reports can be saved on disk or printed.

The package can reportedly monitor nonmodem functions and detect problems in the computer room environment, T-1 telephone lines and power supply in monitored equipment.

The $4,990 Network Windows system includes a 64-port modem-use monitor, 64 interceptor connectors, four intercept cables and software for $4,990.

Communication Devices, Inc., 1 Forstmann Court, Botany Village, Clifton, N.J. 07011 (201) 772-6997.

Statistical multiplexer

Micom Systems, Inc. introduced a statistical multiplexer that supports from two to eight channels over one composite link.

Each channel of the **Linesaver** reportedly can be configured to support a different flow control and data rate. The Linesaver also reportedly supports flow control translation, speed conversion and Hewlett-Packard Co.'s ENQ/ACK protocol.

A floating command mode allows any connected asynchronous device to control, configure and diagnose the Linesaver. The unit employs the cyclic redundancy check error detection and retransmission technique.

Linesaver models are available with an internal 2,400 bit/sec or 9.6K bit/sec modem for transmitting over analog leased lines. A version with an internal integrated service unit — a combined data and channel service unit — is also available for transmitting over digital lines at speeds of 2,400 bit/sec, 4.8K bit/sec and 9.6K bit/sec.

A basic two-channel Linesaver lists for $890. The basic four-channel version costs $1,190; the basic eight-channel model is $1,890. The internal CCITT V.26-compatible 2,400 bit/sec modem is available for an additional $600, and the internal 9.6K bit/sec CCITT V.29-compatible modem is an additional $1,600. The internal integrated ser-

See **Multiplexer** page 26

Let's talk about the cost of being *down.*

A typical T1 network can save you $5000 per *day* when it is up. And cost you $5000 a *minute* when it is down.

Because when your network is down, your critical applications are simply not available. You pay through lost business. Lost productivity. Lost information.

Here's why the IDNX® transmission resource manager from Network Equipment Technologies® keeps your critical applications available *more:*

Redundancy redundancy redundancy.

(You can't have too much.)

Redundancy of all the vital components in every IDNX node. Even more important, the *intelligence* in the system provided by over 25 man-years of software to self-heal rapidly, at the node level and on the network level, with minimal downtime, and without operator intervention.

Such redundancy *must* be a fundamental architectural feature of the network system; it cannot be bolted on afterward any more than you can wire spare wings onto a jetliner. Please don't let any vendor convince you otherwise.

Because of the fundamental reliability in our architecture, we can guarantee an impressive level of applications availability. The reason you want a reliable network in the first place.

Count downtime in your payback equation, and N.E.T. is your only T1 choice.

Here's what puts N.E.T. customers ahead:

First: *Functionality.* Data. Voice. (Including compression.) Video. The ability to integrate *any* equipment into an intelligent, expandable private network. With more features and capabilities than alternative equipment. Compare.

Second: *Compatibility.* With existing communications standards. With the emerging ISDN standards. And with all major T1 common carriers. Again, compare.

Third: Unequalled *reliability.* Our technology, through designed-in, nonstop redundancy and an intelligent, self-healing network architecture means our customers' critical applications have *higher availability*—the true measure of reliability. We invite comparison.

Fourth: Our *service.* Beyond maintenance, a system that can be diagnosed quickly, from your offices or our 24-hour-a-day, seven-day-a-week Technical Assistance Center. Down to the board level on any network node. Service that extends to network design and planning. Service that makes the task of building a private corporate network *practical.* Compare.

Finally: Our *proven* success. With installations all over the U.S., we have solved the thorny problems that are still merely on paper at most of our competitors. By all means, compare.

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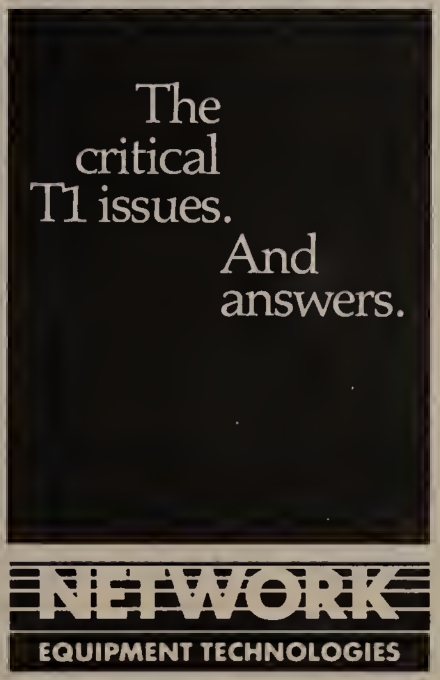

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PRODUCTS & SERVICES

Multiplexer from **page 25**

vice unit costs an additional $690.

Micom Systems, Inc., P.O. Box 8100, 4100 Los Angeles Ave., Simi Valley, Calif. 93062 (805) 583-8600 or (800) 642-6687.

PC-to-PC link enhanced

Meridian Technology, Inc. released an enhanced version of its communications package that allows a personal computer to access, control and operate another personal computer over an asynchronous or serial port link.

Carbon Copy Release 3.0 remains a two-piece package. One-half of the package resides on the local personal computer. The other half, residing on the remote personal computer, polls the communications port waiting to make the link. A Release 3.0 feature allows the remote half of the package to be disabled so the communications port can be used for other functions.

Release 3.0 also includes added features such as remote printer control, dial-back security with password, a log file with full audit trail that provides a tally of all interactions and interactive graphics support. Other features include a hot key that supports toggling between a communications session and a PC-DOS session, an automatic logon routine, the ability to disable and activate a remote personal computer keyboard, display of modem and phone line diagnostics on-screen and support of most asynchronous modems.

All transmissions between the personal computers are automatically encrypted. Standard package features include file transfer with data compression, voice and data switching and full-color support.

Cost for Carbon Copy Release 3.0 is $195.

Meridian Technology, Inc., Suite 120, 1101 Dove St., Newport Beach, Calif. 92660 (714) 476-2224.

X.25 communications monitor

Dynatech Packet Technology, Inc. announced a device that monitors up to 20 X.25 communications sessions and produces records of those sessions.

The **Multi-Log X.25** unit is typically attached to an X.25 trunk running the bit-oriented link access procedure protocol. It is positioned between a packet assembler/disassembler or a host computer and a modem. It monitors the packet level data frames sent in each of up to 64 concurrent transmissions, determines sender and receiver locations of each transmission, reports which location is responsible for transmission charges and notes the date, time and duration of each transmission. Data collected by the unit is sent to either a local printer or a computer system through an RS-232 connection.

The Multi-Log X.25 costs $2,995.

Dynatech Packet Technology, Inc., 6464 General Green Way, Alexandria, Va. 22312 (703) 642-9391.

Electronic document storage and retrieval system

Prodigy Systems Corp. introduced an electronic document storage and retrieval system for banking, finance and health care industry applications.

The **System 2000 Document Storage** system consists of a file server, document scanner, image page printer, optical disk storage, magnetic disk storage, ultra-high-resolution multifunction workstations and Ethernet local-area network capabilities.

The system handles both image and Ascii text data. The system's on-line capacity reportedly ranges from 60,000 to one million image pages, with maximum total storage capacity of more than 28 million pages.

Prices for the System 2000 Document Storage system start at approximately $140,000.

Prodigy Systems Corp., 2601 Casey Drive, Moutain View, Calif. 94043 (415) 965-9900.

Net design tool

General Network Corp. announced a network design and analysis tool for voice and data networks.

The **Cadnet** modular software runs on a Digital Equipment Corp. MicroVAX II and allows users to design, analyze and optimize both voice and data networks.

The systems designer module enables users to work with graphics to depict their networks. Network characteristics such as costs, distance and location can be stored in a data base. Once the network design has been stored on the software, 11 Cadnet modules can be used to analyze the networks.

The Cadnet analyzer module contains three submodules and allows users to perform network simulations, analyses and optimizations. The voice network optimizer

provides least-cost routing optimization, detail call processing and traffic engineering.

The data network optimizer has modules for centralized data network optimization, performance and response time analysis and local access device location optimization for concentrators and multiplexers.

A rate and tariff data base that contains the local access and transport area pricing considerations is available.

Pricing for the Cadnet software package ranges from $15,000 to $97,000.

General Network Corp., 5 Science Park, New Haven, Conn. 06511 (203) 786-5140.

Autodial, autoanswer modem

US Robotics, Inc. has introduced an automatic dialing, automatic answering, asynchronous 1,200 bit/sec modem with a fall-back speed of 300 bit/sec.

The **Courier 1200** modem is compatible with a Bell 212-type modem at 1,200 bit/sec and a Bell 103 modem at 300 bit/sec.

The Courier 1200 modem includes most of the features of the company's Courier 2400 modem, including call-duration reporting, modem status summary reporting, repeat command and call progress detection.

In addition, the modem includes automatic speed selection in answer mode, analog loop-back self-test in both answer and originate modes and internal test pattern generation.

US Robotics, Inc., 8100 N. McCormick Blvd., Skokie, Ill. 60076 (312) 982-5010.

48-channel mux

Fibermux Corp. announced a 48-channel multiplexer for both single- and multimode fiber-optic cable.

The **FX 6401** line of multiplexers can support user speeds from 300 bit/sec to 2M bit/sec and all commonly used interfaces including RS-232, RS-449, V.35 and MIL188.

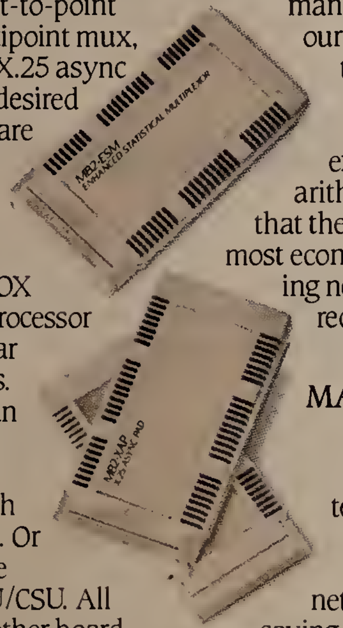
Three models are available: For single-mode fiber, the **FX6401/SM** works at distances up to 10 miles; for multimode fiber, the **FX6401/H** can be used to five miles and the **FX6401/L** to two miles.

Field-selectable master clocking options allow extensive hub and tandem FX6401 configurations that can be tied to existing nets.

The device includes integrated test sets that monitor end-to-end system performance and initate switch-overs to standby common logic module and standby fiber.

Prices range from $3,500 to $20,00 per unit.

Fibermux Corp., 21630 Lassen St., Chatsworth, Calif. 91311 (818) 709-3782.



Here's the box.

A quick look at the MICOM™ BOX will tell you this is no ordinary data concentrator. In fact, the MICOM BOX Type 2 is the most flexible to configure and easiest to install data concentrator on the market.

It couldn't be easier to respond to new applications or to tariff changes. With six FEATUREPAK cartridges to choose from you can make the MICOM BOX function as a point-to-point async stat mux, a multipoint mux, or even a multiplexing X.25 async PAD. Simply select the desired FEATUREPAK™ firmware cartridge and plug it in.

EXPANSION'S A SNAP.

Inside the MICOM BOX you'll discover a microprocessor "engine" plus a modular system of circuit boards. And in minutes, you can expand the number of channels from 4, to 10, to 16. Add modems with automatic dial back-up. Or switch to digital service with an integrated DSU/CSU. All by just snapping in another board.

The user, not the factory, determines system parameters—such as flow control, data rate, and special host support. So you get greater flexibility, performance, and ease of installation.

THERE'S SOMETHING IN IT FOR EVERYONE.

It's inexpensive to expand the number of channels or add modems. Field service calls won't slow you down. Non-technical personnel can install MICOM BOX upgrades using nothing more sophisticated than a screwdriver.

Network managers can configure, monitor, and test the entire network from any async terminal anywhere on the system using our unique Command Facility software. In fact, our menus are so clear-cut that even first-time users can do it.

Finally, corporate executives, using simple arithmetic, can quickly prove that the MICOM BOX is the single most economical solution to increasing network performance and reducing telephone line costs.

THE MICOM BOX MAKES OBSOLESCENCE OBSOLETE.

The MICOM BOX Architecture is all you'll need to graduate from small, point-to-point, leased-line networks to a variety of cost-saving multipoint configurations.

Our integral modems are soft—controlled by the multiplexor itself. Auto dial back-up for failed leased lines is transparent. And data rates of up to 9600 bps are available.

And because it's fully compatible with your presently-installed MICOM Micro800 concentrators and X.25 access equipment, your financial investment is protected, too.

Quite simply, the MICOM BOX provides the low cost, open-ended answer to accommodating new applications and emerging networking standards. So there's never a risk of obsolescence.

CONCENTRATE. IT'S CHEAPER.

Data concentration is fundamental to your networking success. But now the rules are changing.

You must deal with deregulated and continually changing tariffs. A growing number of transmission technologies. The demands of desktop computers and distributed databases. And adapting to the various protocols of major vendors like DEC, DG, Prime, Tandem and HP.

That's why we developed the MICOM BOX. To bring together everything we've learned about making data communications less costly, easier to manage, and more adaptable to change. We've simplified every aspect of installation, daily usage, network expansion and troubleshooting.

As a result, one MICOM BOX and a handful of our FEATUREPAK cartridges are all you need to tackle a range of applications that would have previously required as many as 55 separate models. It's a system that changes as your company's needs change. Efficiently and economically.

That's what you'd expect from MICOM, the world leader in low-cost, multifunction stat muxes. Our experience makes us the only real choice for datacomm professionals who demand the best products and support.

The MICOM BOX. How did we ever pack so much into it? To find out, just call us at 1-800-MICOM-U.S. for a free 16-page brochure that details the reasons why the MICOM BOX is the data concentration solution you've been looking for.

MICOM®

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▶CHARLES RIVER

Software upgrade to MAP/TOP

Universenet bent to fit the standard.

FRAMINGHAM, Mass. — Charles River Data Systems, Inc. recently upgraded its Universenet networking software so that it conforms to all seven layers of the Technical and Office Protocol and the first five layers of Manufacturing Automation Protocol Release 2.1.

The firm says its Universenet Release 3.0 now complies with the International Standards Organization's Class 4 multiplexing, transporting and error-detection scheme contained in the transport layer of MAP/TOP. It also said the new release will support the session layer, or Layer 5, of the MAP 2.1 standards.

The enhanced networking package runs on Charles River Data minicomputers operating under Unos Release 7.0, Charles River Data's implementation of AT&T's Unix operating system. The release reportedly uses the Ftam file transfer method to exchange files and documents in a TOP local-area network and will support electronic mail and remote printing in a multivendor net.

Universenet 3.0 also employs a memory management technique that helps increase network performance levels. Configuration tools included in the release support new ways to add computers to the network as well as new ways to configure memory buffers for performance tuning.

The Universenet Release 3.0 lists for $1,500.

Opinions

PURCHASING

WALTER ULRICH

Paving the way for good RFPs

Users and vendors often bemoan one another's behavior during the request for proposal (RFP) process.

Since good proposals should sell good equipment, one would think vendors would have a vested interest in producing the best proposals possible.

Why is it, then, that they sometimes submit poor proposals? Users complain that proposals are sloppy, are submitted late, contain inadequate pricing information, omit references, contain grammatical mistakes and do not match requirements. With results like this, it's no wonder equipment and service buyers and consultants are frustrated.

On the other hand, many vendor proposals are submitted on time, are well-written and address all requirements. There will always be some salespeople who are lazy about preparing proposals. Poor vendor proposals can also be the result of poor RFPs or unrealistic buyer expectations.

Vendors are not obligated to generate an RFP. Communications equipment and services procurement is the result of negotiations between a buyer and seller, and a successful transaction must make good business sense for both parties. Failure to understand this principle of mutuality spells trouble for buyer and seller alike.

Vendors believe in their products and are committed to at least some level of quality and service. They are not in business to write proposals, but to sell their equipment and serve their customers. When vendors are invited to respond to an RFP, they evaluate their chances for gain against the costs of preparing that proposal. If the benefits are less than the costs, vendors are unlikely to make their best effort.

Likewise, the buyer is interested in procuring the best product, not in buying the best proposal. The RFP process is not an end in itself. Rather it is a way to collect information and evaluate vendors. Dogmatic adherence to procurement procedures and mechanical evaluation of proposals can make the process more important than the result.

Some communications buyers and consultants inadvertently make errors that turn off vendors. Vendors respond by pursuing other opportunities that have a greater chance of success. Here are some signals that vendors look for when deciding whether it is worth their trouble to prepare a proposal.

- The RFP may require too much effort. The telecommunications industry is very competitive and profit margins are slim. Therefore, vendors will not pursue a proposal that requires more work than the contract award is worth.
- Vendors perceive that the buyer is going to decide solely on the basis of price, and that the quality, service and special attributes of their products will not justify a higher price in the buyer's mind.
- The RFP is submitted to a large number of vendors, so that the chances of winning the contract are reduced. When many vendors are involved, some may feel that the evaluator will not be able to give enough attention to their proposals to make the effort worthwhile.
- The procurement procedures are too rigorous, and are inflexible in terms of proposal formats meetings and deadlines. Users may require that proposals be generated from scratch and prohibit use of a boilerplate proposal that takes advantage of work the vendor has invested in previous proposals.

Such procedures are more like boot camp for vendors, who see them as arbitrary, capricious and unnecessary. How would you feel if one vendor's salespeople demand that you meet all of their terms, attend meetings at their notice, not talk to any of their staff except in carefully controlled ways and that you learn about their products at a group meeting designed to maximize their productivity with no concern for your productivity?

- The RFP is poorly written. Often, key details are left out or requirements are unrealistic and cannot be achieved. A poorly structured or incomplete RFP makes it impossible for vendor proposals to be complete and accurate.

When used properly, proposals that are returned will reflect the quality, time, effort and sensitivity that went into generating the RFP. Good vendor relationships, a well-written RFP and an intelligent procurement process almost always produce a good proposal.

A few key points should help get superior results from the procurement process. Many of these tips do not apply to government entities and large companies that require competitive bidding for all procurements.

Do your homework. Make sure you fully understand your current situation, needs and technical requirements. Also, take the time to

See **RFPs** page 39

Ulrich is president of Walter E. Ulrich Consulting, Inc. in Houston.

HYBRID NETWORKS

PHILIP L. ARST

The best of both worlds

Integrating voice and data on dedicated T-1 lines is a networking approach that communications managers are turning to more often for lower costs, higher bandwidth data applications and improved network control.

Businesses are going after these private networks with a vengeance, taking advantage of deregulation to eliminate all traces of public network facilities. At the same time, they are saddling themselves with expensive and proprietary multiplexing equipment.

But networks needn't be an either/or proposition. The real benefit of postdivestiture tariff structures is that users can mix and match public and private services for the optimum solution. However, without a strategy that takes into account the standards and compatibility issues of public network services, today's private network operators will be locked into fixed solutions.

Specific current carrier services that should be considered in private network planning are AT&T's Software-Defined Networks (SDN), Megacom Service and Customer Controlled Reconfiguration (CCR) and MCI Communications Corp.'s Prism.

An upcoming public network service that can also be expected to provide substantial benefits is subrate, digital multiplexing, through which users obtain digitial private-line services for less than T-1 rates down to a single voice-grade channel or a 9.6K bit/sec data channel. Another impending public net service is the extended superframe T-1 format, which will provide additional benefits in the realm of data integrity and network management.

There are many situations where a hybrid network of private lines and interexchange carrier services is a more cost-effective approach than an entirely private network. For example, one major issue is the need to provide full backup for most private-line routes.

Although one T-1 circuit may be able to reduce costs significantly by replacing multiple voice-grade lines between two facilities, it cannot provide the failure tolerance that many separate voice-grade lines can offer. In the all-private network case, it might be nice to have that redundant T-1 line, but it cannot be cost-justified.

However, dual T-1 lines between all locations are unnecessary if a carrier service such as SDN backs up the dedicated private lines, or if the CCR service alternates route traffic around failed lines. The CCR approach will still permit network control while eliminating the need to route some of the long-haul lines off the public net into private facilities. This method will save the cost of excess mileage and double local channels needed for on-premises switching.

Private-line service must be provided to sites that cannot justify one T-1 circuit, let alone a pair for redundancy. These sites must also be integrated into the main T-1 backbone facilities. Unfortunately, today's T-1 multiplexing equipment does not efficiently support multiple voice-grade line routes and the subrate digital multiplexing services expected to be available in the future.

Therefore, to obtain sub-T-1 rate network connections to all points, expensive digital-to-analog conversion interfaces are required on the multiplexing equipment. Because this equipment resides within the backbone facility, the network must also incur the cost of bringing the voice-grade circuits off the net and back via local channels.

Many companies also use Wats services and are studying SDN, Megacom, Prism and other bulk message services. All of these services require special access lines to con-

Arst is president of Communication Strategies Associates, Inc., a data communications network consulting firm in Cupertino, Calif.

▶TELETOONS — By Phil Frank

The note says the network is down again...
Phil Frank

NETWORK MANAGEMENT

BY VINCE BARRETT

It's 11 p.m. Is your LAN OK?

The prevalent hands-off management policy with regard to local-area networks is a time bomb. This outdated outlook is changing, however, and that change will have a significant effect on the local net market.

"MIS departments are facing their greatest networking challenge since the migration from EP [IBM 270X terminal emulation program] to Systems Network Architecture," says an MIS director at one of the nation's largest corporations.

He made this comment in reference to the second phase in the evolution of the local-area network industry. This maturation phase is typified by local-area network users' realization that they cannot exist in the closed universe of stand-alone local networking and that local-area network installations must be managed.

The personal computer, initially a stand-alone device, acquired basic connectivity to the mainframe by emulating dumb terminals. Ultimately, networked personal computers were able to communicate on a peer-to-peer level through evolving protocols such as IBM's Advanced Program-to-Program Communications (APPC) and the Open Systems Interconnect (OSI) model.

The extent and severity of the local-area network management problem are exemplified by the following incident. Gartner Group, Inc., a Stamford, Conn.-based consulting firm, recently interviewed the MIS director and staff of a major West Coast university regarding their campus network strategy.

Questions about the role of local-area networks on their campus brought the same response. With the sole exception of the School of Engineering, they displayed little interest in local-area networks, asserting that they had no need for them.

When asked how many local-area networks were installed on campus, the MIS staff replied that there were two local-area networks, both in the School of Engineering.

A subsequent network study unearthed not two, but 42 local-area networks — and revealed that more were planned. Personal computer anarchy had become local-area network anarchy.

To complicate matters further, many departments using these local-area networks needed to communicate with the university's mainframes, with departmental minicomputers and with other local-area networks.

The complex mishmash of protocols, standards and network management systems was about to come crashing down on the MIS staff, which was fully capable of handling software release upgrades and 3270 response-time complaints, but was totally unprepared to inherit these grass roots, local-area networks.

What was lacking was a plan — a local-area network strategy.

MIS departments can no longer afford to be uninvolved in local-area network acquisitions. Such acquisitions may be a departmental buying decision, but they must fit within well-defined MIS guidelines. The cost of noninvolvement is high.

In many cases, the lack of a local-area network strategy can force users to scrap existing local-area networks and start over. The cost of the local-area networks themselves is insignificant when compared with the costs of rewiring a building and, most importantly, having to retrain end users. No MIS department wishes to incur the wrath of the end user.

The same elements that go into sound data processing network planning must be applied to local-area networks. The view that local-area networks and data processing networks are different entities with little or no interrelationship is short-sighted and naive.

The notion that each department will possess one or more individuals capable of diving under the rug to trouble-shoot the departmental local-area network is a delusion. These pioneers of local-area network technology may exist in some departments, but pioneers move on.

After this happens, guess whose phone will ring when the departmental local-area network crashes?

In fact, the issue of departmental local-area network planning and procurement control vs.

See **Management** page 39

Barrett is vice-president and director of local-area communications at Gartner Group, Inc. in Stamford, Conn.

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nect the local channel to the interexchange carrier. Therefore, under current T-1 networking approaches, these expensive local channels cannot be integrated into company backbone special-access facilities.

Users need to rethink their approaches to private networking. The postdivestiture tariffs now permit the separation of interexchange and local channel connections. Services can also be mixed. Instead of integrating just private-line services, why not integrate public network services and configuration control facilities with private-line services to obtain the best of both worlds?

What is needed to implement these hybrid networks is private-line multiplexing equipment that conforms to telephone company standards and can directly access their voice-grade circuits via a digital-access, cross-connect service. To do this, the equipment must be compatible with the interexchange carriers at the DS0 level — the single voice-grade line portion of a T-1 digital stream.

Most of today's T-1 multiplexing equipment is compatible only with telephone company standards at the DS1 level, or T-1 service, and cannot access all the public network services that are needed.

Fortunately, some T-1 multiplexing and facilities management equipment that meets the standards at the DS0 level is available. At least two vendors, Granger Associates of San Jose, Calif., and Avanti, Inc. of Newport, R.I., supply this capability. The flexibility that results enables T-1 backbone facilities to be dedicated to private voice and data circuits or to be split off under CCR to serve sub-T-1 portions of a company's private net.

Local channels that are needed for private networking and Wats, SDN and Megacom access can be integrated for special access to the interexchange carrier central office. This approach will eliminate a group of costly last-mile tail circuits that have become a major factor under the new tariffs.

Ridding users of the all-or-nothing alternative is what divestiture was all about. So why not have the best of both worlds with a hybrid private lines and public services network?

NETWORK WORLD

Features

September 8, 1986

Midi: the instrumental interface
Musicians in tune with high tech turn to the musical instrument digital interface to integrate their electronic sounds. Before 1982, a keyboardist was limited by his two hands in the number of sounds he could create. Now, a half dozen synthesizers can be connected through the Midi standard to produce an integrated crescendo of music.
Page one.

The personnel game
Specialization no longer fits the bill. Today's telecom departments are looking for Renaissance men and women to fill their ranks. Employees must be well-versed in a number of business skills as well as in the latest technologies. Aetna Life & Casualty has put this recruiting strategy to work.
Page 33.

Building expectations
Imagine a world where cable trays are obsolete and suspended ceilings no longer hide a tangle of wiring. Smart House Venture is working to develop a single universal cable system that supplies all power, voice, data and video through one universal outlet. The first tests will be in the residential market.
Page 35.

Salty advice for T-1 shoppers
Preparation before selecting a T-1 multiplexer is the key to smooth sailing. Users must start with a clear understanding of their requirements or risk getting shipwrecked by a multiplexer that's either insufficient for their needs or has features that are nice, but expensive and unnecessary.
Page 37.

FEATURE FOCUS

Midi: the instrumental interface

Multi-instrument connectivity is music to composers' ears.

Continued from page 1

expensive but powerful music networks.

At the heart of Midi is a simple concept. If electronic musical instrument manufacturers can agree on a straightforward method to hook up their various devices, then everyone will be better off. All that Midi really amounts to is an outline on paper stating how various aspects of this interface should be accomplished. Somewhat simplified, the main points of the outline are as follows:

- Midi is a hardware and software specification for interconnecting electronic musical instruments. It is designed to be fast enough for real-time musical applications, and flexible enough to handle many types of devices and events.

The specification calls for the use of a common 5-pin plug for interconnection. This inexpensive plug has been in use on European hi-fi equipment for years.

- Midi uses an asynchronous, serial data transfer protocol operating at 31.25K bit/sec. This speed ensures that there will be little or no delay between action and sound. For example, it takes slightly less than one millisecond to transmit the beginning of a new note struck on a keyboard, including any key velocity data.

Achieving a higher data speed would make the digital circuitry inside the Midi products much more expensive, limiting the technology to well-paid professional musicians.

- Unfortunately, the Midi transmission rate is not one of the common computer RS-232 communication rates, so a custom interface is needed to interface a personal computer with Midi.

The software portion of the Midi specification is somewhat more involved. Midi is essentially a specialized language for describing and controlling musical events in real time, and it provides digital words for describing or requesting such events. It is standard terminal proprietary software that supports Ascii file transfer and the X.Modem error-checking protocol.

The Midi specification also includes the concept of channels for addressing a specific device connected to a common Midi bus, much like phoning a particular neighbor over a party line and somehow managing to get the other neighbors to ignore your conversation. Midi provides 16 discrete channels for information flow. The concept of channels allows Midi to function as a local-area network and eliminates many of the collision concerns common to local networks.

A history of Midi

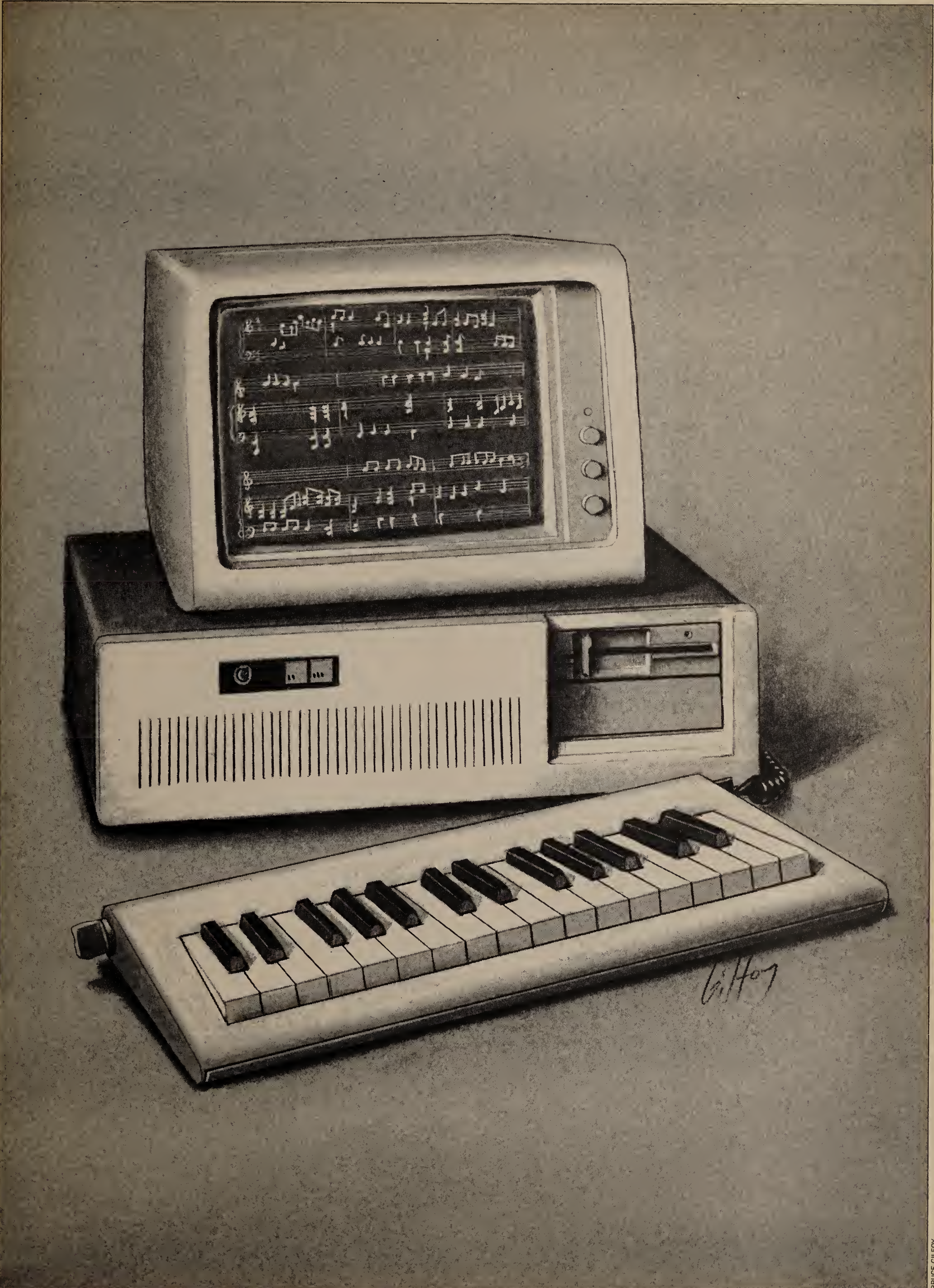
Late in 1981, Sequential Circuits President Dave Smith and engineer Chet Wood spearheaded a proposal for an electronic music interface standard. It was to be a serial interface like RS-232, but would be faster and less expensive to implement, and it would provide a higher degree of compatibility. The immediate goal of the proposed standard was to allow musicians to play many synthesizers simultaneously. The standard would allow music to be produced on a synthesizer by playing notes on another synthesizer's keyboard.

The long-term goal was to delay obsolescence by allowing instruments from different manufacturers to be compatible with one another over a long period of time.

By the summer of 1982, technical representatives from the major electronic musical manufacturers

Continued on **page 32**

Cunningham is director of sales and manufacturing for J.L. Cooper Electronics, a maker of Midi accessories in West Los Angeles.



BRUCE GILFOY

From **page 30**

got together to discuss the interface. As a result, the "universal synthesizer interface" was born. That particular proposal was later integrated with work done by Japanese manufacturers that were conducting similar research. Their combined efforts produced the Midi standard. The first commercially available Midi synthesizer was Sequential Circuit's Prophet 600, first shipped in December 1982.

The effect on the buying public was slow to develop but would prove to be irreversible. Synthesizer players previously had to contend with a host of incompatible interfaces, or no interfaces at all, on their electronic equipment. By late 1983, Midi had changed all that. Midi became a stamp of approval that validated numerous products in the marketplace.

The standardization process had some difficulties. Because of a disagreement in the then-fledgling Midi proposal, the first attempt to connect the nascent Yamaha DX-7 and the Prophet 600 at the June Midisoft '83 music industry trade show was largely unsuccessful. Because the details of the Midi specification were not similarly implemented, the two synthesizers had the tendencies either to hang up or to continue to play notes long after the keyboard had been released.

By August 1983, however, most of the major inconsistencies were resolved as the Midi 1.0 Specification was defined at a meeting in Japan. With the publication of the Midi 1.0 Specification, things began to move forward as more manufacturers saw the opportunity and felt the pressure to jump on the Midi bandwagon. By the summer of 1984, Midi was everywhere, in synthesizers priced from $495 to $8,000.

Midi applications

The first use of Midi was to play many synthesizers from a single keyboard. Suddenly, keyboard sounds on commercial recordings became much thicker and broader as musicians began "stacking" many keyboards to get a single sound; it was not uncommon to use six or seven synthesizers connected, via Midi, to create a single string line. But synthesists still had only two hands available, and when they began to look for more powerful ways to control their instruments, they discovered personal computers.

A personal computer storing and replaying the Midi messages functions as a type of digital multitrack tape recorder called a sequencer. Sequencers are available from various manufacturers as either dedicated, self-contained units or as software packages for personal computers, ranging from less than $100 for a software package to $3,000 for a dedicated hardware sequencer.

Sequencing was one of the first applications for a personal computer in Midi systems, and is still the most popular. At last count, there were some 65 sequencer software packages offered for various personal computers, including the Apple Computer, Inc. Apple II and Macintosh, the Commodore Business Machines, Inc. Commodore 64 and the Commodore Amiga, the IBM Personal Computer XT and AT and compatibles, the Atari 800 series and ST series.

Depending on the computer and memory available, up to 999 individual tracks, or musical parts, can be recorded in the computer, and many sequencers offer on-line graphics editing. Some even allow sophisticated music transcription of recorded compositions. By using a sequencer connected to a few Midi synthesizers, a solid-state symphony can be written, scored and performed on a tabletop.

Other applications for Midi were quick to follow the sequencer. Patch editors and librarian software appeared, automating the job of creating and storing different synthesizer sounds, or patches. Using a set of Midi commands known as "System Exclusive," a user with a personal computer and a patch editor can access a synthesizer's internal programming controls, see those controls represented graphically on the computer's screen and program a patch on the synthesizer. Groups of patches can then be named and stored on a floppy disk using a librarian program. Editors and librarians are often combined into a single software package.

The ability to store patches and samples on floppy disks allowed users of a particular synthesizer to swap sounds with one another by simply swapping floppies. Small companies soon sprang up that offered libraries of sounds for sale on disk. But floppy disks traveling through the mail are subject to potentially fatal hazards, and users began looking for a better way to exchange sounds and songs. Enter the modem.

Although Midi was originally designed as a keyboard-oriented electronic music interface, it has since been greatly enhanced. For example, people can avoid exchanging floppies and can use personal computer communications software to communicate music sequencer data, patch data or sample data over phone lines between physically separated recording studios. In addition to note commands, the specification allows for synchronization between Midi devices by defining Midi Clock, which permits an electronic drum machine to play in time with a sequencer.

There is even a proposal now before the Midi Manufacturers' Association and its counterpart, the Japan Midi Standard Committee, to define Midi Time Code, which will eventually allow Midi devices to interface with and control such machinery as audio and videotape recorders and compact disk players.

Fairlight, manufactured by Fairlight Instruments Pty. Ltd. in Australia, is an expensive studio sampling device that includes a sequencer, a high-quality digital sampler and a waveform editor. It also includes Midi to allow it to interface to other music systems and outside instruments.

The Fairlight instrument bundles a dial-up modem and communications software into the Fairlight Computer Musical Instrument (CMI) Series III, to allow it to upload and download sampled sound files from services such as the Performing Artists Network (PAN), as well as from other Fairlight CMIs at speeds of up to 9.6K bit/sec. At an average system price of nearly $70,000, the Fairlight is expensive to use solely as a terminal. In fact, it takes more than an hour to transmit a 2M-bit, sampled sound file at 1,200 bit/sec. That's the bad news.

The good news is that Fairlight says it anticipates the ability to perform diagnostics and service in real-time on the Series III via modem and the ability to transmit Midi works in progress.

Midi meets the modem

Over the last two years, music-oriented bulletin board systems have appeared throughout the world. The largest and most popular of these is PAN. PAN members can log on to the system from anywhere in the U.S. and Canada, as well as from Japan, Australia and the UK. The bulletin board is accessed via dial-up modems attached to personal computers.

Once on-line, PAN members can choose from a variety of services. There is the obligatory conference section, where users can talk with one another, and where group discussions and interviews with industry heavyweights are held. The forum section allows members to post Midi-related questions and directly address manufacturers of both hardware and software, most all of whom are members.

The data base section is perhaps the most exciting of all and contains hundreds of patches that can be downloaded. Users contribute original sounds and samples to the data base via modem, and it is not uncommon to see a single sound generate many files as users download it, modify it and upload it again to the data base.

By restricting access to a certain section of the data base, some software companies actually distribute updates to their registered users via PAN. Access to PAN is via the Uninet, Inc. or Tymnet/McDonnell Douglas Network Systems, Inc. value-added networks, which maintain local phone numbers in most metropolitan areas.

The network has attracted a diverse membership from within the professional music industry, from Herbie Hancock to Barry Manilow. The sharing of sounds and Midi technology that occurs on PAN has contributed to the rapid growth of Midi throughout the world.

The commercial possibilities of marketing sounds and software via modem have spawned a number of small companies run by music professionals. Brian Bell was production manager and sound mixer for Herbie Hancock and Carlos Santana. Bell's newest project is called Synth-Bank.

"Synth-Bank is an on-line publishing service for electronic keyboard sounds and drum machine patterns," Bell says. "I'm trying to set up worldwide access for sound programmers and end users to be able to get together without the problems of artist unavailability, high overhead of traveling and mailing disk media back and forth.

"My organization will handle synthesizer sound files and drum machine sequences on-line, as well as through dealers in cartridge and disk media forms. We're planning to be open on PAN for this year's Christmas season."

Midi changes the music biz

Midi is making radical changes in the way commercial music is produced. Composers working at home with a sequencer and several synthesizers are able to produce entire compositions, without recording studio facilities. The expensive process of committing music to tape can be performed later in the studio in much shorter time, since the majority of the music need only be played back by the computer and printed on audio tape.

In the studio, Midi has found a home in many sound modification devices such as echo, reverb and equalizers, permitting direct control of an effect's parameters from a computer or Midi synthesizer. Audio mixers with Midi control are just now emerging, promising sophisticated automation of the mixing process at remarkably low cost.

In a live performance, the concept of Midi is gaining wide acceptance. *Performance* magazine recently estimated that as many as 70% of all rock bands use sequencers in concert to augment the on-stage musicians and help recreate studio special effects in a live show. Stage lighting is commonly controlled by computer, and Midi is becoming the protocol of choice because it allows the lighting to be synchronized with musical cues.

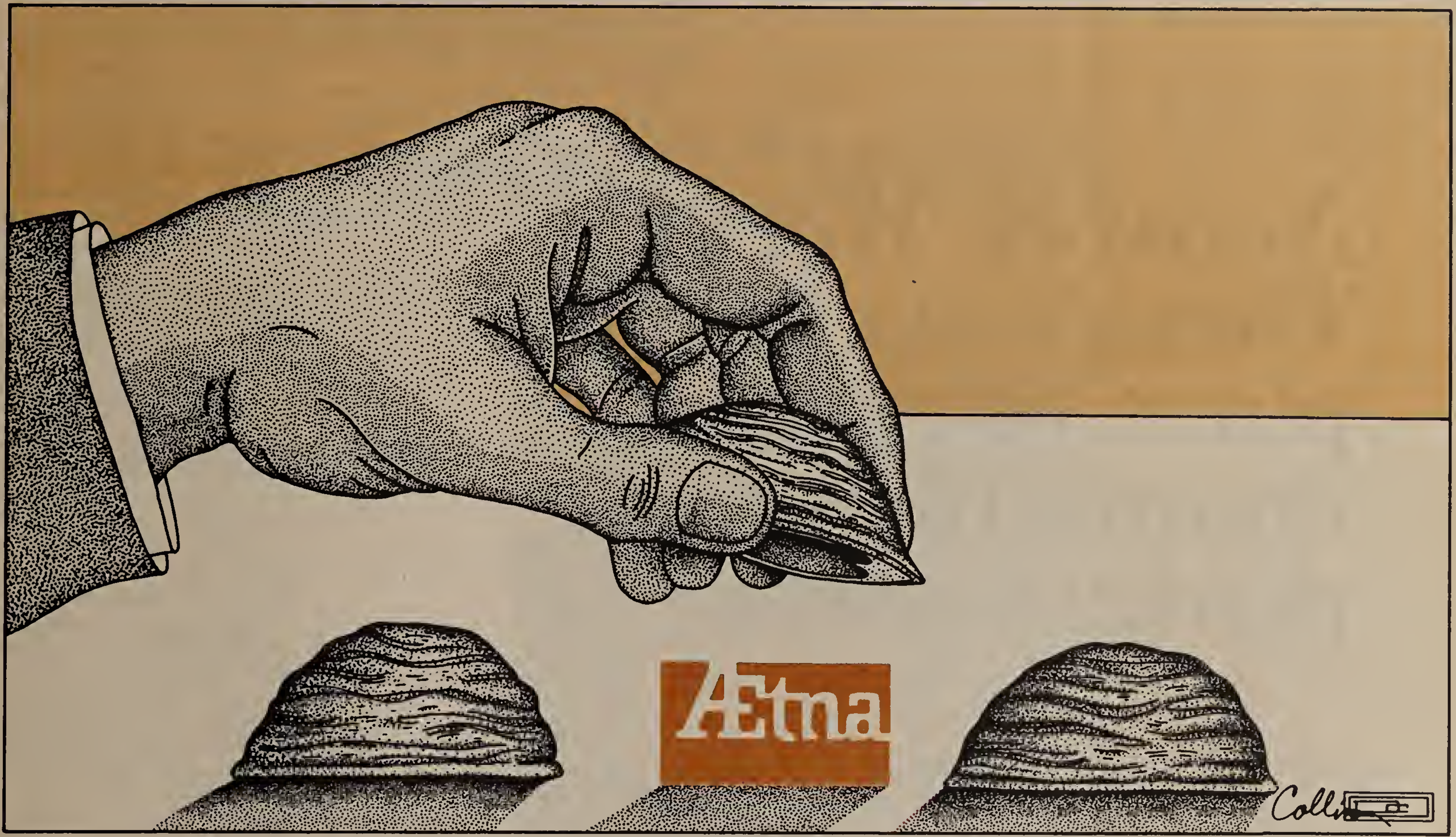
There were quite a few Midi commands, mainly in the controller family, that initially went unused by the synthesizer industry because only two of the possible 128 controller commands were actually defined in the first edition of the Midi 1.0 Specification. Midi's open architecture approach can expand into other areas of the entertainment industry, such as audio for film and video.

A fertile area for exploration that was designed into the Midi specification is the System Exclusive command. With commendable foresight, the Midi founders gave manufacturers freedom within the Midi format. It is strictly up to the manufacturer to decide what to do. The only requirement is that the manufacturer publish, perhaps in the owner's manual, a description of what the manufacturer's System Exclusive code does.

The growth of Midi has resulted in a much greater level of communication among musicians. People are actually sharing sounds and swapping samples of music. Telecommuting could be an alternative for musicians as well. All of this control allows producers and recording engineers to achieve new sound effects and produce music much more quickly in an environment where studio time really does equal money.

▶ COMMUNICATIONS RECRUITING

The personnel game



BY ELLEN M. FALBOWSKI
Special to Network World

"The age of the specialist is passing," according to John Donovan, assistant vice-president of corporate telecommunications at Aetna Life & Casualty. "As technology is integrated at lower levels in the organization," he says, "the employee with the broadest skills is the most valuable."

The administrator for Aetna's field office voice unit, Carol Preibis, agrees. "I look for well-rounded individuals," she says. "And they must have personality, exuberance and confidence."

Like every other company that uses computers and telephones, Aetna has grown increasingly more dependent on its telecommunications. But Aetna has learned it isn't easy to find qualified people to manage its increasingly complex systems.

The Hartford, Conn.-based insurance company supports nine major data networks and 400 voice systems, as well as videoconferencing and local-area communications. To manage these systems, the corporate telecommunications department employs 175 people.

Falbowski is communications consultant for the corporate information systems services/telecommunications division of Aetna Life & Casualty in Hartford, Conn.

The job categories include technology assessment, network design, project management, programming support, network engineering, operations, budgeting and financial forecasting and customer service.

These positions require knowledge of private branch exchanges, cabling, satellites, tariffs, front-end processing, local-area networks, value-added networks, hardware, software, problem determination and performance monitoring.

Donovan says the telecommunications department has been growing at a rate of 15% per year. Annual employee turnover in that department also averages about 15%. As of Aug. 1 of this year, 56 of the 175 positions had been filled.

The types of abilities Donovan says he looks for in employees are changing. However, he says the two most important skills are project management and verbal and written communications.

Li-Hwa Ting, administrator of network design and consulting for Aetna, says she doesn't find many candidates with a thorough understanding of tariff issues or with experience in personal computer communications.

Further, she says many candidates are software programmers or field engineers who would like to design networks but do not have design experience. Those with a background in network design often also have 10 to 15 years of experience in telecommunications or data processing, so their salary requirements are too high.

Debbie Brennan, administrator of Aetna's telecommunications business systems support, has a similar problem. A candidate with a business application analysis and programming background usually doesn't understand telecommunications, and telecommunications analysts usually don't know how to program for business requirements. There are no classes, for example, on how station message detail recording data is recorded in a PBX, so some on-the-job training is necessary. "It's rare to find someone who can go right to work," Preibis says.

On-the-job training is supplemented with education. The department uses the Aetna Institute for Corporate Education for training in nontechnical areas, such as

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project management, business writing, presentations and management.

Courses in telecommunications are available from vendors and consultants. These are sometimes offered in-house when there is sufficient demand.

Informal vendor presentations keep employees current with the latest technologies. Some employees are also enrolled in formal degree programs, such as the master of science degree in telecommunications offered by Southern Methodist University.

Finding candidates with operation skills is not difficult, says Tim Hickey, administrator of one of the company's three Network Support Centers. Technical colleges and the military have been good sources. However, Hickey's Network Support Center is unusual because it provides first-level support to the users of Aetna's claims group benefit-processing network. The center also provides instruction in second-level and third-level problem determination, network monitoring and installations.

Hickey's staff receives more than 1,000 calls per week, making good telephone skills a must. "Users aren't calling because they're having a good day," he says. "In fact, often they are having a bad day, and my people must be able to handle a user's negative attitude and turn it around."

Because of the difficult search for qualified telecommunications candidates, the department advertises nationwide in trade journals and is usually prepared to pay agency fees and relocation costs. Each ad brings in about 300 resumes.

Fred Taverne, a senior recruiter for Aetna, says he always reads cover letters because they demonstrate candidates' writing skills — or lack of them.

Other recruiting is done through local newspapers, at universities that offer master's degrees in telecommunications and at local colleges with computer science and engineering programs.

Aetna's part-time and summer internships help train computer and engineering students in the practical aspects of telecommunications, and some of the interns are offered full-time jobs upon graduation.

Another source of potential candidates is the company's open posting system. In the customer service unit, an understanding of Aetna's business needs is possibly as important as technical skills; therefore, candidates for these positions are sought from the company's operating divisions.

In a typical unit, which recently filled three positions, one candidate came from a local university, one made contact through a headhunter and one was selected from within the company.

Cross-training helps current employees broaden their knowledge and increase their effectiveness. The need for cross-training is beginning to be addressed in a number of ways. For example, a reorganization of Aetna's telecommunications department last year created new units in which previously separated disciplines were combined.

Preibis needed employees with experience in PBXs and networking. The PBX unit merged with the voice network design unit, and the employees cross-trained each other. Vendors offer instruction on voice/data integration, although there are no immediate plans in the department to implement it. The new technology assessment and network design units now handle requests for both voice systems and data systems.

Projects now integrate so many aspects of technology that employees usually have the opportunity to expand their previous limits with each new project.

For example, a project to move a data base from a minicomputer in one location to a mainframe in another location brings together specialists in cables, data switches, protocol converters, front-end processors and communications software, as well as the data base users.

Finally, employees are encouraged to apply for other openings in the department, and some have taken advantage of the opportunity to move into voice communications after several years of data communications and vice versa.

Even more basic than cross-training is the need to keep employees informed of new technologies and new projects in the department. There is a monthly series of presentations to the department given by employees on varying topics of general interest, ranging from local-area nets, fiber and cabling, to tariffs and regulatory issues. Other informal sessions are offered by knowledgeable staff members upon request.

For now, Aetna will continue to look for candidates with broad technical and interpersonal skills. It will also continue to provide education to improve the skills of its employees.

In the future, Aetna says it plans to work with colleges and universities to upgrade their telecommunications curricula in an effort to reduce the shortage of qualified telecommunications personnel.

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▶SMART STRUCTURES

Building Expectations

With the advent of smart houses, can smart office buildings be far behind?

BY PAUL SUSCA
Special to Network World

ELISA TENENBAUM

From its inception, the concept of the intelligent office building has attracted starry-eyed disciples who envision an age of intelligent buildings. In such buildings, all systems would be integrated and simplified, including telecommunications, data processing, security, fire protection and energy management, as well as heating, ventilation and air conditioning (Hvac).

But like the picture phone, the truly intelligent office building has been long in coming, and the hoopla that originally surrounded smart buildings has died down.

Recently, however, the National Association of Home Builders (NAHB), whose members build 95% of all single-family homes in the U.S., have raised the smart building banner anew. Their efforts, initially aimed at residential dwellings, could eventually spread to commercial buildings, fulfilling the promise of the intelligent office building.

Smart house

The Smart House Development Venture, organized by the research arm of the NAHB in 1984, is a partnership of nearly 40 manufacturing companies, with an advisory membership of 17 nonmanufacturing entities.

Smart House was initially set up to make life easier for building contractors who have to coordinate the installation of a spaghetti-like collection of wiring — AC power distribution, telephone, television, thermostat and low-voltage DC for doorbells and outdoor lighting in residential buildings.

Among the member companies are Apple Computer, Inc., AT&T Technologies, Inc., Bell Northern Research, General Electric Co., Honeywell, Inc., National Semiconductor Corp., North American Philips Corp., Northern Telecom, Inc. and Square D Co.

This group and other member companies expect to develop a single, integrated wiring system, interfaces, communications standards and a control scheme. The new resources would serve for electrical distribution, communications, audio, video, fire and security services.

The companies represented by Smart House ante up millions of dollars to become members and to share ownership of the technology. Their incentive is to be able to manufacture Smart House-compatible appliances and equipment that presumably will give them an edge over nonmember competitors.

Although the Smart House project is nearly two years old, it is still just getting started. Member companies report that the venture is bogged down in the administrative and business details of research funding, ownership of the technology and licensing to nonmember companies.

But Smart House spokesman Ken Geremia says the project will soon be finalizing specifications and beginning the design phase. This month, the schedule calls for starting construction of two test homes, one gas and one electric.

In about a year, another pair of prototype homes will be built, followed by about 15 other prototypes scattered around the country.

☞Continued on **page 36**

Susca is a free-lance writer based in Rindge, N.H.

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Universal cabling

The Smart House concept relies on a new hybrid cable that will replace wiring now used in new homes. Smart House cable will comprise regular three-conductor power distribution cable as well as a number of twisted-pair and coaxial cables, Geremia says.

The wiring will terminate in a combined outlet controlled by an intelligent interface. Smart House plugs will be the same for lamps, telephones and computers, but they will be no larger than currently used AC power plugs.

The number of contacts on the plugs will be greater, however, including three for power, one or two for coaxial, and 13 to 16 for telephone and data, Geremia says.

One unusual aspect of Smart House is that it will handle power distribution by employing the concept of programmed, closed-loop power. Programmed power means that each electrical device, using a low-speed (possibly 1,200 bit/sec) signaling channel, must request either AC or DC power and voltage. For example, a toaster may need 10 volts DC, while a washing machine may require different power levels for its various cycles.

Closed loop means that power is unavailable at an outlet until a device makes the proper request to the intelligent controller. This approach should allow the manufacture of less expensive appliances by eliminating expensive AC motors, transformers and transmissions while providing additional safety benefits.

The EIA's role

Smart House is not the only standards-setting effort under way that will affect residential buildings. Another two-year-old effort, the Consumer Electronics Bus Committee of the Electronic Industries Association (EIA), is trying to develop a command and control system for the home that follows the International Standards Organization's Open Systems Interconnect (OSI) model. This system will accommodate power-line, twisted-pair, coaxial cable, lightwave cable, radio frequency and infrared communications.

"I believe that ours is the first attempt to fill in Layers 4 and 5 of the [OSI] model," says Gene Lubchenko, chairman of the wire bus subcommittee. "Prior to this, all of the [home control] standards we've seen stick to Layers 1 and 2. But by the time you get to the network level, it becomes a custom job."

By using the OSI model as a tool to ensure that messages between different devices are properly unwrapped and understood, the committee hopes to agree on the logical statements and commands to be used between devices.

Lubchenko expects his committee to recommend a new set of physical terminations and possibly a new wiring bundle for use in future construction, but he stresses that there has been no decision as to whether every outlet should carry all media.

> *"The Electronic Industries Association is trying to develop a command and control system for the home that follows the OSI model."*

No new wiring would be required to use the consumer electronics bus, Lubchenko says. "But if you want to have [data] services that cannot go over the power line, you must use or install twisted-pair, coaxial and possibly fiber, depending on your needs."

The system begins to sound like an all-purpose power and data local-area network that could just as easily be employed in offices as in homes.

"Perhaps this will be a transportable outlet that people could emulate, or use parts of, in the commercial environment," Lubchenko says. "But we're not addressing that directly."

There has been some degree of cooperation between Smart House and the EIA's activities. Smart House may ultimately adopt EIA's communications standards, but the two groups have different philosophies.

Smart House will develop a proprietary standard and will employ a totally new wiring scheme. As a research and development partnership of manufacturers, Smart House is geared toward the design and sale of new products that are incompatible with existing homes.

On the other hand, Consumer Electronics Bus is aiming for a voluntary, open standard for use with existing wiring and other media.

Still other standards-setting efforts may impact the home front, according to Yoko Kusama, a market analyst at Boston-based Yankee Group, the consulting firm that performed a market study for the Smart House project. Kusama says three Japanese groups — the Japanese Manufacturers Industries Association, the Ministry of International Trade and Industry and the Ministry of Posts and Telecommunications — are working on communications standards for devices used in the residential market.

Commercial possibilities

Despite the pressing need in commercial buildings for some kind of combined wiring scheme, all of these efforts are aimed at the residential market.

According to Ken Geremia, Smart House started with single-family, residential construction for three reasons. It's a large market; the participating companies know the market; and, according to Smart House studies, the market is ready.

Yankelovich Clancy Shulman, a Westport, Conn.-based market research firm, conducted a market study for Smart House. Robert L. Cohen, senior research associate, says his firm evaluated the venture favorably but had reservations about the time frame of the project and how quickly it would be accepted by consumers. The study was limited to residential buildings, and Cohen would only speculate that the venture will eventually affect commercial buildings.

Smart House members refuse to comment on how the project will affect commercial buildings, but the participation of companies such as Apple, AT&T, Carrier Corp., Honeywell and Northern Telecom suggests that the possibility of expansion into the commercial market may be one of the venture's selling points.

Richard Geissler, executive director of the Intelligent Buildings Institute in Washington, D.C., agrees that any technological advancement dealing with the improvement of communications systems and the conditioning and distribution of power can be expected to affect the commercial part of the market. However, it is still too early to say just what those effects will be.

> *"One unusual aspect of Smart House is that it will handle power distribution by employing the concept of programmed, closed-loop power. Each electrical device, using a low-speed (possibly 1,200 bit/sec) signaling channel, must request either AC or DC power and voltage."*

Tom Bolling, manager of the New Services Identification Department at Bell Northern Research in Ottawa, has been involved with the project since its inception, and he says he fully expects Smart House products to be used in offices and light industrial buildings.

Does that mean that what Bolling refers to as the apocryphal intelligent office — using a phone to control the photocopier, lighting, Hvac and elevators — will finally materialize as a result of Smart House?

Bolling says that the venture is not trying to address the exact services to be provided through Smart House products, but rather it is trying to develop the technology and the communications bus. Applications will be left to individual vendors.

Don Hutchison, director of Robertshaw Controls Co.'s corporate research and development center in Richmond, Va., speculates that custom-integrated circuits, communications protocols and software developed for Smart House interfaces are possible developments from the venture. But he stresses that the project's first tasks are administrative rather than technical.

Hutchison says he expects Smart House to be embryonic for several years, but that its eventual growth will be exponential. At that point, technologies will spin off to influence the building automation industry in general, he says.

Telecommunications managers will have to start thinking about electrical distribution systems if Bell Northern Research's Tom Bolling is correct. "I think perceptive consulting engineers will be discussing [the needs of] telecommunications managers, and [the engineers] will point out that there is a range of products that will become available where power controls and communications are integrated," Bolling says.

"The telecommunications manager would be well-advised to speak with his services people, Hvac and electrical, to discuss the possible use of Smart House in a new development because it will benefit all of them." In addition, Bolling says he thinks offices with existing data local-area networks will be able to be integrated with Smart House systems.

"The concept and the technology have already intrigued a number of people [who are] looking at applications in commercial buildings," Geremia says. "How soon that might be coming about, I really can't say with any certainty."

Late 1988 or early 1989 is Geremia's best guess as to when Smart House will go beyond the demonstration phase and into new housing. What happens after that is anybody's guess. Rapid consumer acceptance could lead to prompt introduction of the technology in commercial buildings. On the other hand, the smart office could develop independent of the smart house.

Some indication of the participants' expectations for moving the technology into the office may appear in the next few months. That's when the administrative arrangements will be worked out regarding the ownership and licensing of Smart House technology. ◪

NETWORK WORLD

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1 **My primary areas of activity.** Circle ONE only.

I am involved in evaluating communications (data, voice and /or image) products and services:

1. for *use within my* own company/organization
2. for *resale* to other companies/organizations
3. Both

a **For communications, my primary responsibility is:** Circle ONE only.

1. Data Communications
2. Voice Communications
3. Both

2 **Circle only the ONE title classification which most applies to you.**

Company Management

11. Chairman, Pres., Owner, Gen. Mgr., Partner, Director, CIO, VP, Dir. Head of Finance, Admin. Procurement

Communications Management

Data Communications

21. Management
    VP, Dir., Mgr., Head, Chief: Data Communications, including Networks, Engineering, Design, R&D, Application Development
22. Supervisory/Staff
    Supervisor, Head : Networking, Design, Analysis, Engineering, R&D, Applications, Services

Telecommunications

31. Management
    VP, Dir., Mgr., Head, Chief: Telecomm., Voice Comm., including Networks, Engineering, Design, R&D, Application Development
32. Supervisory/Staff
    Supervisor, Head: Networks, Design, Analysis, Engineering, R&D, Applications Services

Factory Communications

41. Management
42. Supervisory/Staff

MIS/Data Processing

51. Management
    VP, Dir., Mgr., Head, Chief: MIS/DP, Systems Application Development, Operations, Office Automation
52. Supervisory/Staff: Supervisor, Head of System Design, Analysis, Applications

Others

75. Consultant
80. Educator
85. Financial Analyst
90. Marketing/Sales
95. Other ______________

3 **Job Function**
Which one of the following best describes your functional involvement with communications (data, voice, and/or video) products? Circle ONE only.

Corporate

1. Business Management, Planning and/or Development

Communications System/Network

2. Management, Planning and/or Development
3. Implementation and/or Operation
4. Other ______________

4 **Which one of the following best describes the primary business activity of your organization at this location?** Circle ONE only.

Consultants

11. DP/Communications Consulting Services
12. Consulting Services (except DP/Communications)

End Users

13. Manufacturer (other than computer/communications)
22. Finance/Banking/Insurance/Real Estate
23. Education
24. Medicine/Law
25. Wholesale/Retail Trade
26. Public Utility/Transportation
27. Mining/Construction/Petroleum Refining/Agriculture/Forestry
28. Business Services (excluding DP/Communications)
29. Government: Federal
30. Government: State/Local

Vendors

41. Carrier: including AT&T, BOCs, Independent Telcos, Public Data Networks, Intern'l Records Carriers
42. Interconnect
43. Manufacturer Computer/Communications Equipment
44. Value Added Reseller (VAR), Systems House, Systems Integrator
45. Distributor
46. DP/Communications Services (excluding consulting)
95. Other ______________

5 **In which ways do you typically become involved in acquiring communications products (data, voice, and/or video) and services?** Circle ALL that apply.

1. Recommend/Specify
2. Identify/Evaluate Potential Vendors
3. Approve the Acquisition
4. None of the Above

6 **Check ALL that apply in columns A and B.**

A. I am personally involved in the acquisition process (specification, selection, approval) for the following products and services:

B. These products and services are presently in use at this location:

	A	B	*Product/Services*
			Computers
01.	☐	☐	Micros
02.	☐	☐	Minis
03.	☐	☐	Mainframes
			Data Communications
04.	☐	☐	Communications Processors
05.	☐	☐	Comm./Networks Software
06.	☐	☐	Digital Switching Equipment
07.	☐	☐	Facsimile
08.	☐	☐	Modems
09.	☐	☐	Multiplexers
10.	☐	☐	Protocol Converters
11.	☐	☐	Network Mgmt. & Control
12.	☐	☐	Test Equipment
13.	☐	☐	3270 Controllers
			Telecommunications
14.	☐	☐	PBXs
15.	☐	☐	Key Systems
16.	☐	☐	Central Office Equipment
17.	☐	☐	Integrated Voice/Data Terminals

	A	B	*Product/Services*
			Transmission/Network Services Equipment
18.	☐	☐	Microwave
19.	☐	☐	Satellite Earth Stations
20.	☐	☐	Local Area Networks
21.	☐	☐	Wide Area Networks
22.	☐	☐	Packet Switching Equipment
23.	☐	☐	Fiber Optic Equipment
			Communications Services
24.	☐	☐	Packet Switching Services
25.	☐	☐	Cellular Mobile Radio Services
26.	☐	☐	Electronic Mail
27.	☐	☐	Enhanced Services
28.	☐	☐	Centrex

7 **Estimated value of communications systems, equipment and services:**

A. which you helped specify, recommend or approve in *last* 12 months? Check only ONE in column A.

B. which you plan to specify, recommend or approve in *next* 12 months? Check only ONE in column B.

	A	B	
1.	☐	☐	Over 10 million
2.	☐	☐	$5-10 million
3.	☐	☐	$1-5 million
4.	☐	☐	$500,000-1 million
5.	☐	☐	$250,000-500,000
6.	☐	☐	$100,000-250,000
7.	☐	☐	$50,000-100,000
8.	☐	☐	Under 50,000
9.	☐	☐	Don't know

8 **Estimated gross annual revenues for your entire company/institution:**

Circle only ONE.

1. Over $1 billion
2. $100 million to $1 billion
3. $5 million to $100 million
4. Under $5 million

9 **Estimated number of total employees at this location:**

Circle only ONE.

1. Over 5,000
2. 1,000-4,999
3. 500-999
4. 250-499
5. 100-249
6. 50-99
7. 20-49
8. 1-19

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PLEASE TAPE HERE

▶PURCHASING

Salty advice for T-1 shoppers

Don't let them sell you a sloop if you need a racing yacht.

BY BRIAN NESMITH
Special to Network World

First in a two-part series.

Like buying a sailboat, selecting a T-1 multiplexer is an exercise in ingenuity.

Before stepping onto the showroom floor, the sailor must examine his needs. How many people must it hold? Will it be used only in coastal waters, or must it be rigged for the open seas? How many people will be needed to operate it? How much will it cost? The answers to these questions will lead to the selection of the appropriate sailing craft.

To assure smooth sailing when using T-1 lines or when operating a T-1 network, the communications manager must examine the most critical equipment in the T-1 network — the T-1 multiplexer.

The most difficult job is determining what functions the multiplexer must support and what capabilities are useful, but not necessary, for his needs. If the user has a clear understanding of his requirements, the multiplexer selection process is greatly simplified. However, three actions must be

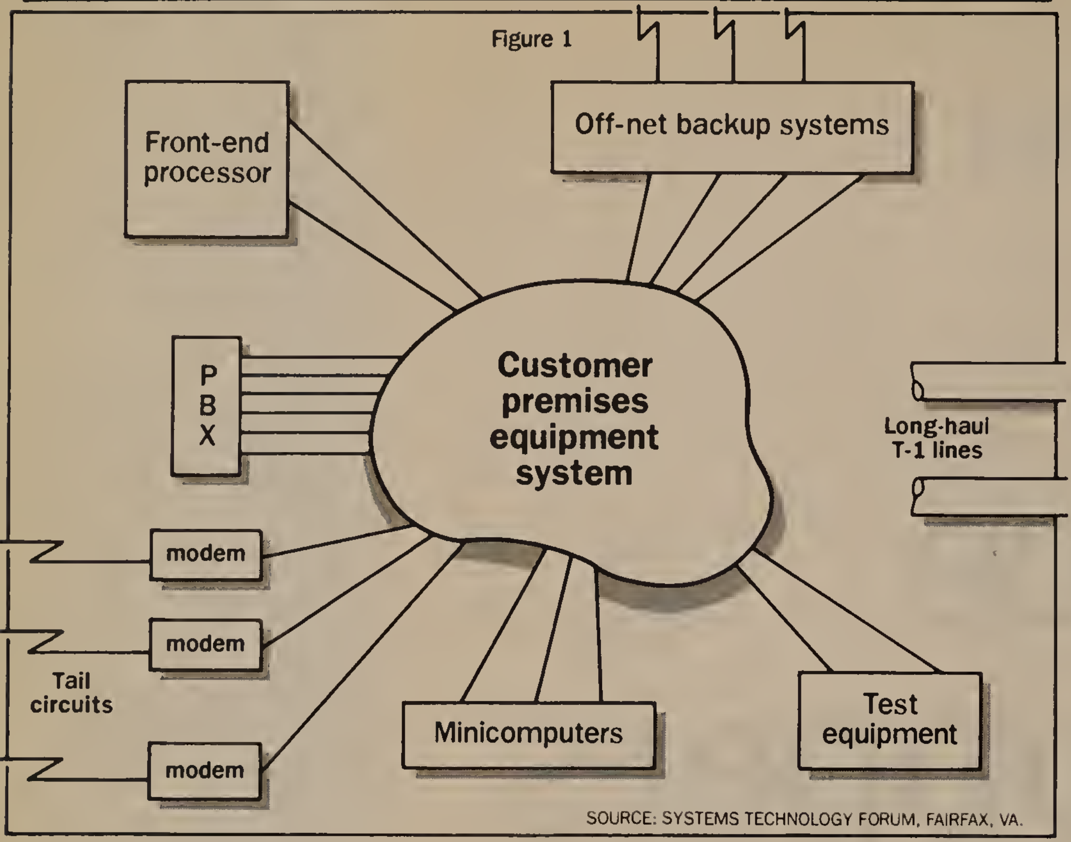
☞ Continued on **page 38**

Nesmith is a consultant with Network Strategies, Inc. in Fairfax, Va.

JON MCINTOSH

Network concentration point

Figure 1



SOURCE: SYSTEMS TECHNOLOGY FORUM, FAIRFAX, VA.

From **page 37**

performed before the multiplexer selection process begins.

The first step is to perform a network requirements analysis, which usually consists of documenting the existing facilities in the voice and data network. It may also require collecting information on possible applications such as videoconferencing.

Next, using the information collected in the requirements analysis, the user should develop several alternative T-1 network designs.

These designs are used to identify the capabilities required of the T-1 multiplexers and to compare the costs of the T-1 network to the existing configuration.

Finally, the user must prepare a Request For Information (RFI) or Request For Proposal (RFP) that is based on the requirements identified in the first step and the multiplexer functions identified in the second step.

By documenting requirements in an RFI or an RFP, the user provides useful information to vendors so that they can respond with their best design and product proposal for the system. These steps ensure that the user is not buying a product that is overly sophisticated or too expensive for his needs or a product that can't support his requirements.

Requirements analysis

The requirements analysis should identify traffic flows and applications as well as determine their level of criticality.

For many companies, this step is relatively straightforward because all of the communications facilities are the responsibility of a single individual. In some companies, however, the T-1 network may be used to integrate voice and data traffic from multiple agencies, subsidiaries or divisions.

In such situations, communications managers may need to use survey forms augmented by interviews of major communications users to identify all traffic requirements. Information should be collected on both present and future requirements.

Once the requirements are completed, the next step is to compile traffic for voice, data and video into separate matrices. This gives the network designer greater flexibility in designing a more cost-effective network.

Voice channels, for example, can be compressed to lower speeds to provide up to four times the traffic capacity typically allotted to voice. On the other hand, data channels cannot be compressed in the same manner; therefore, different techniques must be used to optimize bandwidth for data traffic.

Some multiplexers offer submultiplexing, which combines many lower speed data channels in a highly efficient manner. Without this capability, multiplexers use up to 64K bit/sec of bandwidth to support data channels at 9.6K bit/sec or less.

Using the traffic matrices and the information collected in the requirements analysis, the user should design several alternative configurations.

High-level designs include identifying the concentration points, selecting a customer premises equipment architecture and reconfiguring tail circuits.

The concentration points are where all of the voice and data channels in a region are multiplexed for transmission to another concentration point (see Figure 1).

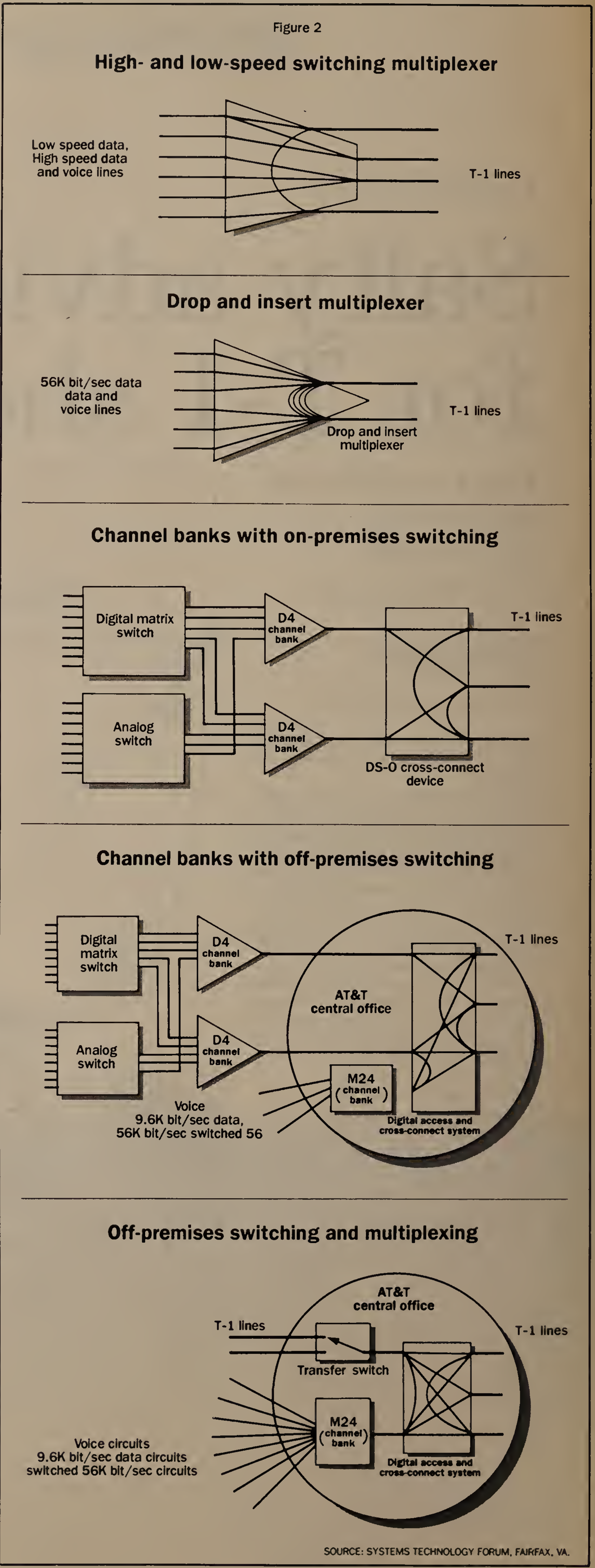
The customer premises equipment system performs multiplexing and switching functions, terminating the long-haul T-1s and also multiplexing and switching lower speed channels on and off of the T-1 lines. The five types of network architectures are differentiated by the amount of switching and multiplexing capability contained in the concentration point (see Figure 2). These architectures include:

- High- and low-speed switching multiplexers
- Drop/insert multiplexers
- Channel banks with on-premises switching

Continued on **page 39**

Five basic types of T-1 network architectures

Figure 2


High- and low-speed switching multiplexer
Low speed data, High speed data and voice lines
T-1 lines
Drop and insert multiplexer
56K bit/sec data data and voice lines
Drop and insert multiplexer
T-1 lines
Channel banks with on-premises switching
Digital matrix switch
Analog switch
D4 channel bank
D4 channel bank
T-1 lines
DS-0 cross-connect device
Channel banks with off-premises switching
Digital matrix switch
Analog switch
D4 channel bank
D4 channel bank
AT&T central office
T-1 lines
M24 (channel bank)
Voice 9.6K bit/sec data, 56K bit/sec switched 56
Digital access and cross-connect system
Off-premises switching and multiplexing
AT&T central office
T-1 lines
T-1 lines
Transfer switch
M24 (channel bank)
Voice circuits 9.6K bit/sec data circuits switched 56K bit/sec circuits
Digital access and cross-connect system

SOURCE: SYSTEMS TECHNOLOGY FORUM, FAIRFAX, VA.

From **page 38**

- Channel banks with off-premises switching
- Multiplexing and switching off-premises.

The high- and low-speed switching multiplexer is a sophisticated switch and multiplexer that supports network management, network control, voice compression and data channel support. This architecture can be further subdivided into high-capacity and low-capacity categories according to the number of T-1 lines the multiplexer can support.

High-capacity multiplexers can support more than 10 T-1s. Multiplexers most commonly grouped into the high-capacity category include Network Equipment Technologies Co.'s IDNX and Cohesive Network Corp.'s CN/1. Examples of low-capacity multiplexers include Timeplex, Inc.'s Link family and Avanti Communications Corp.'s Ultramux, which support six to eight T-1 aggregate lines.

High- and low-speed switching multiplexers are for users who have major data requirements and are operating multinode networks. The cost of these multiplexers can range from $30,000 to $150,000 per node.

The drop/insert multiplexer is a cheaper, less versatile architecture that has a similar customer premises equipment structure to the high- and low-speed switching multiplexer. It is a simple architecture that can terminate only two T-1s, and it provides only minimal networking capability.

Drop and insert refers to the capability to drop certain channels out of the T-1 and to insert different channels in their places. Coastcom's D/I multiplexer is a good example of this architecture. Drop/insert multiplexers are ideal for three or four node networks with minimal networking requirements. The cost ranges from $10,000 to $40,000 per node.

The only difference between the third and fourth architectures is that the switching function, performed by a digital access and cross-connect system (Dacs), occurs off premises in one and on premises in the other. A Dacs is a switching device that cross-connects channels or groups of channels within multiple T-1 links.

Multiplexing capability is provided by a channel bank, which is a simple multiplexer with no networking capability. Network management and control is provided by the Dacs. Both of these architectures are better suited for voice than data, and they are also more effective in star configurations. Dacs equipment is supplied by a number of manufacturers, such as Northern Telecom, Inc., ITT Corp., and Tellabs, Inc.

Off-premises Dacs are provided by a service such as AT&T's Customer Controlled Reconfiguration. Multiplexers that use these architectures are older and less functional. Users that have networks based on D4 channel banks were most likely involved in T-1 networking at its infancy. Using Dacs equipment to upgrade the network provides a modular and flexible method of upgrading the network.

The cost for this architecture varies from $6,000 to $60,000 per node, depending on configuration. The wide variation in cost is because of the additional equipment that may be needed to provide network management, network monitoring and testing and network reconfiguration capabilities.

The customer premises equipment system for channel banks with on-premises Dacs must be modified to support submultiplexing. This architecture requires the use of off-premise 56K bit/sec multiplexers to support submultiplexing and interface conversion equipment to convert V.35 transmissions to a format that can be terminated on a D4 channel bank. The cost and complexity of this architecture changes dramatically when data requirements are added to the network.

The last architecture is off-premises switching and multiplexing. Multiplexing and switching are based on services offered by the local operating companies, AT&T and the other common carriers.

This alternative is used when the traffic within a metropolitan area is not concentrated in a single building or campus. Traffic is multiplexed in the local central office or in an AT&T serving node. This architecture is usually more appropriate for organizations with multiple agencies, such as states with universities, libraries, state police, secondary schools and state government.

When evaluating customer premises equipment architectures, the user should eliminate architectures that do not satisfy the requirements identified in the analysis phase. The second step includes comparing prices and capabilities. Once the architectures capable of satisfying the user's requirements are identified, the entire network should be cost-justified.

For most corporations this means doing a cost comparison of the existing system against the proposed T-1 network.

The cost analysis should include transition costs, personnel costs, capital costs and recurring costs. Typically, a net present value analysis is done to account for the different monetary flow rates of the two alternatives. If the T-1 network does not have a break-even of three years or less, the cost-effectiveness of the T-1 network is highly suspect.

Break-evens beyond three years are riskier because of the possibility of a change in the structure of local operating companies and AT&T tariffs. Some corporations may justify the T-1 network for competitive reasons, rather than for cost. The T-1 network may be used as a strategic weapon. For example, many common carriers have had problems installing leased circuits, and users have experienced long delays. If a T-1 network is in place, leased circuits can be installed in days, rather than in months.

Assuming that a T-1 network still looks viable, the user can begin to select a multiplexer. The requirements identified earlier can be summarized in an RFP and disseminated to qualified vendors.

Part two of this series will discuss this final phase of selecting a T-1 multiplexer.

RFPs from **page 28**

understand the technologies involved. If you need help, retain a consultant.

Do not expect vendors to give you an objective education about the basic technology.

Screen the vendors before selecting those from whom you want to receive proposals. Meet with representatives of the most promising candidates and narrow down the vendors to a small group of contenders. Reducing the field to three or four vendors is ideal.

When using an RFP, draft one that is clear, concise and provides for an easy vendor response. Make sure the effort the vendors must invest is consistent with the size of the procurement.

Allow the vendors as much flexibility as possible while ensuring that the key information is provided in a way that is comparable from vendor to vendor. Many minor details and obvious points need not be included in the RFP, since they can be handled in the negotiations that take place after the proposals are submitted.

Keep the lines of communication with vendors open. The ability to get last-minute information may have a big impact on the thoroughness of the vendors' response and the accuracy of their pricing. While the vendors are preparing proposals, contact them and see how they are doing.

After the negotiations are complete and the contracts signed, notify the unsuccessful vendors. Meet with them in person and thank them for their effort.

Inform them about the strengths and weaknesses of their proposals. They put a lot of work into responding to your requirements; let them know how you arrived at your final decision.

These suggestions are not all-encompassing. However, they will improve your relationship with your vendors and help you get better responses when you ask for proposals. Most important, they help you and your company benefit by selecting the best equipment for your needs.

As for the vendors, there is no excuse for sloppy or poorly written proposals.

The reputations of vendors and their products depend on a consistently thorough, professional and competent manner.

If a vendor's sales representatives are not interested in responding to an RFP, they should say so and tell the buyer why they will not be responding.

The vendor can sometimes aid the buyer in understanding the shortcomings of his procurement process.

Vendors and users alike will benefit by keeping an old saying in mind: "If something is worth doing, it is worth doing right."

Management from **page 29**

MIS control represents perhaps the most significant shift in the Gartner Group's clients' perspective. Last year, the majority viewed local-area network procurement as a departmental issue with limited MIS involvement.

This year, they are beginning to see MIS control over local-area networks as necessary and inevitable. The key issue forcing MIS involvement is, resoundingly, network management.

No adequate solutions to multivendor, local-area network management are currently available in the marketplace.

But IBM, at least, has indicated a direction and a promise of network management. These facts probably explain the positive response to IBM's Token-Ring Network, at least in the pilot project stage.

That is, they probably correlate with the need to look to IBM for network management. Clearly, FUD, or fear, uncertainty and doubt, are doing their jobs.

IBM's Token-Ring Network seems to be the clear preference for corporate pilot projects during the next 12 months.

The slow rollout of token net enhancements is causing little concern among major corporations. Some state that they will wait "as long as it takes" for the token net rollout.

AT&T, on the other hand, has little reason for encouragement. Its networking products, Information Systems Network and Starlan, have a few loyal advocates, but show little new penetration into MIS local-area network planning. This is in marked contrast to last year, when users showed great interest in AT&T's local-area network product direction.

Apparently, AT&T's strategy of early product announcements with delayed product availability is not as attractive to users as delayed product announcements with short availability lead times.

Digital Equipment Corp. and Ethernet-type local-area networks continue to make a strong showing. Close to half of all companies indicate a continued implementation of DEC and Ethernet local-area networks. When asked about the role of baseband coaxial local-area networks, most users describe them as more of an add-on to existing installations or as a specialized local-area network function than a strategic product.

Finally, facilitywide, local-area networks have become a major issue in local-area network planning, and the primary applications are 3270 support and building cabling consolidation. Although interest in facilitywide, local-area networks has risen during the past 12 months, significant procurements and implementations are 18 to 24 months away.

▶ VOICE/DATA APPLICATIONS

John Hancock weighs its options

Five vendors vie for $8m contract to replace Centrex.

BY PAUL KORZENIOWSKI
Senior Editor

BOSTON — The promised benefits of integrated voice and data applications are sitting at the doorstep of John Hancock Mutual Life Insurance Co.

Stephen F. Kelley, director of the telecommunications corporate consulting division at John Hancock, is trying to usher those benefits inside as he oversees an $8 million contract for the replacement of the company's existing Centrex services with either enhanced Centrex offerings or a private branch exchange.

Five vendors — none of which Kelley would identify — are in the running for the network, which will service four of the insurance company's five buildings here in Boston's Back Bay area.

The vendors recently received requests for proposals (RFP) on the project.

"Trade-offs exist no matter which product a company chooses," Kelley said. "We want to make sure we understand just what those trade-offs are." Hancock's lengthy RFP was needed to help pinpoint those trade-offs.

More than 20 years ago, Centrex was chosen for the company's oldest building and has since been integrated into all of the company's new facilities.

"Companies do not work with 20-year-old mainframes anymore, so they shouldn't use 20-year-old telephone systems," Kelley said.

Because the company's options are plentiful, Kelley is following the axiom, "Better get it in writing," to the fullest. Two bulky reports sit atop his desk on the 51st floor of the 60-floor Hancock complex, the tallest building in Boston.

> *"More than 20 years ago, Centrex was chosen for the company's oldest building."*

One is the RFP. The other is a lengthy needs assessment, based on detailed interviews with more than 100 key Hancock employees.

A year and a half ago, Hancock decided to examine its ancient voice system. Two items surfaced that justified replacing the service. First was its cost.

"We were spending too much money making adds, changes and deletions," Kelley said.

Unlike more modern Centrex offerings, Hancock's service allowed only the local telephone company to make changes.

Since close to half of Hancock's 8,000 Boston employees change offices each year, the insurance company was paying the telephone company between $60 and $1,000 to swap each telephone extension.

Second, Hancock wanted to install a wiring and hardware scheme that could support present as well as future networking needs.

"We needed a flexible approach that could incorporate new technologies as they become available," Kelley remarked.

The large investment involved in the new network, coupled with a plethora of options, forced the company to develop a lengthy analysis procedure. Two preliminary items were needed to put the procedure in place.

> *"A year and a half ago, Hancock decided to examine its ancient voice system."*

The company hired a consulting firm to help with the evaluation. Kelley's group listened to presentations from eight consulting firms and ultimately selected Cambridge, Mass.-based Arthur D. Little, Inc. In addition to its solid presentation, Arthur D. Little had a list of credible references.

In addition, other Hancock departments had worked with the consulting firm and gave it high marks. Next, Kelley's group determined what users wanted from their telecommunications equipment. More than 100 interviews were completed and then incorporated in the bulky needs-assessment analysis.

The analysis revealed one surprising item. Kelley thought the new equipment would be used primarily for voice and seldom for data. "It's clear to us now that data will be heavily used once we install the new system," he said.

The company then began the process of determining which vendors would be able to supply Hancock with the appropriate equipment.

Kelley talked with sales representatives, and a list of 12 potential vendors was pared to the current five. "We want to work with only one vendor, and some companies could not supply all of the needed pieces," he said.

Work then began on the RFP, and Kelley's group uncovered a mountain of options. "You have to cover all the options and, in some cases, products are very different," he said. For example, comparing the cost of a leased service such as Centrex service and a purchased piece of equipment that would depreciate over time can be very difficult, he said.

In addition to trying to list the differences, Kelley and members of his department visited vendors' home offices and talked with product engineers.

"We wanted to know the vendor's future direction," he said. "Also, product engineers are more able to explain a product's technical features than sales representatives."

Responses to the RFP, which was mailed at the end of May, came from four of the five vendors by Aug. 15.

"I couldn't believe the length of some of the responses," Kelley said. "One response took up seven looseleaf binders." Hancock personnel will examine the proposals throughout the fall and make a purchase decision by the end of the year.

The choice will not be based strictly on which vendor is the lowest bidder.

"Price is a key consideration, but we are interested in other items such as the vendor's future plans," Kelley said.

A Hancock building on Clarendon St., which houses 600 employees, has served as a test bed for some of the new technologies the company hopes to employ on a wider scale.

When the building was refurbished last year, the company also installed new communications equipment.

An AT&T System 85 PBX with a two-year lease connects IBM and Wang Laboratories, Inc. terminals to various computer systems via twisted-pair wiring used with AT&T's Premises Distribution System. Fiber-optic lines run throughout the building's six floors, and on each floor, fiber modems connect the fiber lines to the twisted-pair wiring.

INI from **page 3**

vanced manufacturing technology.

Anthony Friscia, a managing partner with Advanced Manufacturing Research, an industrial automation and integration consulting firm based here, said IBM's announcement of the MAP-compatible products will draw the attention of upper management at numerous user companies.

"Since roughly 70% of the Fortune 500 companies are IBM SNA shops, MIS managers are concerned about how to interconnect different networks," Friscia related. "IBM's increased commitment to MAP, in the form of products, builds confidence of corporate management that IBM will eventually offer products that link MAP nets to SNA nets."

The newly announced MP-500 Interface Adapter allows IBM Industrial Computers to connect to a 10M bit/sec broadband local net compatible with MAP Version 2.1. The adapter comprises a controller board based on Intel Corp.'s 80186 microprocessor and a 10M bit/sec token bus modem board.

Users have been purchasing MAP starter kits for some time. INI announced such a package earlier this year, and Honeywell, Inc. debuted its MAPStart kit at the MAP/TOP Users Group meeting in Seattle this past May.

IBM's entry, the INI-manufactured JX-003 MAP Pilot Kit, consists of a cable starter kit, head-end remodulator, MP-500 Interface Adapter, network management adapter, INI net management software and documentation. The kit supports the interconnection of IBM industrial computers — IBM 5531, IBM 7531 and IBM 7532 — in MAP environments.

Although Friscia asserted that the IBM MAP starter kit would be well-received by the communications user community, he claimed sales of the kits would not substantially affect the size of the MAP equipment market.

Cals from **page 4**

nology in pilot programs but will also work with vendors to set new standards and develop new technologies.

A Communications Steering Committee made up of representatives from various branches of the services and private industry has been established within the Cals organization. This group will be working along with the National Bureau of Standards to decide on the communications architectures and protocols that will be supported by the Cals initiative.

Open Systems Interconnect, Defense Data Network, Manufacturing Automation Protocol and Technical and Office Protocol could all play a part in Cals communications links. Other aspects of the Cals project include graphics data bases, large distributed data bases, automated publishing and systems integration.

Each branch of the armed services has targeted pilot projects in which to explore Cals options. The pilot programs will decide upon standards and technologies to be implemented and create testing procedures once those choices are made. Finally, those standards and technologies will be implemented on the pilot project level.

▶ COMPARATIVE REVIEW

Three V.22bis modems, one clear winner

Codex Corp.'s 2233 noteworthy for following V.22bis specs most closely.

BY JOHN J. HUNTER
Contributing Writer

The CCITT's V.22bis modem standard is another good format emerging from the cooperation between the U.S. and European telecommunications industries.

V.22bis specifications call for a 2,400 bit/sec, asynchronous or synchronous, primary data transmission rate and a 1,200 bit/sec fallback rate that conforms to the CCITT V.22 format.

At either speed, V.22bis modems operate half- or full-duplex over the dial-up network or over two-wire private lines and support an autodial capability that meets CCITT V.25 and V.25bis standards. In addition, these modems are suitable for operation over U.S. and European networks.

For the most part, the framers of the V.22bis standard have realized their dream.

In primary transmission mode, V.22bis modems are compatible. In fallback mode, however, compatibility problems can occur.

There are about a dozen topflight V.22bis modems on the market now. Three that have attained notoriety are the relatively new Codex Corp. 2233, the Multi-Tech Systems, Inc.'s Multimodem 224 and the Hayes Microcomputer Products, Inc. Smartmodem 2400.

All three products can operate with dumb terminals or personal computers and are available in stand-alone or rack-mounted versions or as cards that plug into the IBM Personal Computer. These products are functionally the same as the stand-alone units. The card version of the Codex modem is the 2281, and the Hayes unit is Smartcom II Version 2.1. Multi-Tech's unit is called the MT 224 PC. The general operating characteristics of these modems are shown in the accompanying chart.

> *"There are about a dozen topflight V.22bis modems on the market."*

One of the more popular applications for a V.22bis modem is to team it with a personal computer.

With the modem's built-in autodialer, users can initiate calls directly from the keyboard (no telephone is needed) and use an RS-232-C-interfaced line to pass the dial requests, controls and data directly to the modem.

The plug-in card versions are also offered with communications software, which is bundled into the basic unit or sold separately.

Hunter is president of TMS Corp. in Devon, Pa.

Most V.22bis modems and a number of AT&T 212A format modems used in the U.S. use the Hayes AT command set to control interaction between the terminal and the modem. Therefore, products employing the V.22bis standard and the Hayes AT command set should be compatible. In addition, many terminal communications packages and other applications software also recognize the Hayes command set. Clearly, a modem that does not implement this command set puts the user at a disadvantage as far as compatibility and software choice are concerned.

All three modems mentioned above support the Hayes AT command set. However, only Codex has implemented the V.25bis autodial facility required for European applications. As shown in the chart, all of the modems store telephone numbers, and the Codex and Multi-Tech units initiate automatic redial for busy or incomplete calls.

The number of call retries is critical. Making continuous retries until a connection is made, so-called attack dialing, is a popular approach, but it is not the best one. First, since it cannot detect problems that might have occurred with the line, it continues dialing and wastes time. Second, with some dial-up services, users incur significant telephone access charges for attack dialing.

The Smartmodem 2400 uses a better approach. It has the modem report the problem back to the user so he can initiate the redial. An even better procedure, used by the Codex unit, is to have the modem redial a specified number of times and then try an alternate number.

The Multi-Tech 224 employs attack dialing. The Codex and Multi-Tech modems will recognize a voice, busy signal or dial tone and indicate it on the terminal screen. The Hayes 2400 also recognizes a busy signal or dial tone but indicates a voice answer through its built-in speaker. Since the Hayes unit requires that the user manually enter redial instructions to handle all fail-to-complete situations, this should not present a problem.

Given the overall degraded quality of dial-up network facilities, many users are demanding modems that can perform error detection and corrections. Multi-Tech offers a version of the 224 called the 224E that offers this service. Hayes also provides it through a diskette-resident software package called Smartcom II. Codex has error correction only with the 2281 personal computer modem card.

The advantage of Hayes' technique is that existing stand-alone versions of the 2400 Smartmodem used with personal computers can be upgraded in the field. Codex currently does not offer error correction with the 2233, which puts it at a disadvantage. According to Codex, this facility is under study. Sources say Codex will introduce error correction next January.

Vendors have taken different approaches when implementing the 1,200 bit/sec fallback transmission modes. The V.22bis specification calls for V.22 format at that data rate, but a number of U.S. vendors have chosen the popular 212A format. While these formats are very close, the carrier handshake frequencies and timing differ slightly.

This could cause a problem with both domestic and European communications.

A number of vendors, including Codex, Hayes and Multi-Tech, have hedged their bets by designing V.22 and AT&T's 212A/103 format compatibility into their products. Bell 212A modems operate at 1,200 bit/sec, while Bell 103 modems operate at 300 bit/sec. Compatible V.22bis modems have a primary transmission speed of 2,400 bit/sec, with 1,200 bit/sec and 300 bit/sec fallback speeds.

Users planning on employing V.22bis modems on the dial-up network where dissimilar modems are involved should exercise caution when operating in the 1,200 bit/sec fallback mode. Many modems that are 212A/103-compatible do not use the same pins on the RS-232-C interface to receive fallback speed indications. That could be a problem unless the interface incompatibility can be easily solved.

With the Hayes modem, differences dealing with Data Terminal Ready, Carrier Detect and Data Set Ready signals can be resolved in software; other incompatibilities require new modem cables. Neither Codex nor Multi-Tech allow problems to be resolved in software.

All three modems do a first-rate job in implementing the V.22bis standard, and all can participate in international networks. The Codex 2233 has most closely followed the V.22bis specifications by implementing the V.22 fallback standard and the V.25 and V.25bis autodialing specifications. It should have no problems communicating internationally. Given the quality of the European and domestic lines, however, Codex would do well to fit this modem with an error-correction facility.

The redial techniques employed by Hayes and Multi-Tech are unacceptable, and with certain carriers, they can run up communications access charges. The Hayes requirement that each redial be initiated by the user is a nuisance, and the attack dialing employed by Multi-Tech can waste time when certain types of connection problems occur.

Both vendors would be wise to consider the scheme employed by Codex, where the number of retries can be specified and an alternate number chosen at the end of the redial period. Hayes should also consider adding a multiple telephone number storage facility. Its current one-number capability is next to no capability at all.

The price of the Codex 2233 is $445, and the Multimodem 224 and Smartmodem 2400 sell for $699 and $899, respectively. The error-correcting Multimodem 224E lists for $749, and the Hayes Smartcom II software upgrade is $149. The Codex 2281 lists for $725, and the Hayes Smartcom II Version 2.1 costs $799. The Multi-Tech version of the personal computer modem is offered with and without error correction. The latter, called the MT 224EC, lists for $699. The version without error correction, the MT 224PC, costs $649. All personal computer cards include communications software. ◼

Comparison of V.22bis modems

	Vendor/Product		
	Codex Corp. Model 2233	**Hayes Microcomputer Products, Inc. Smartmodem 2400**	**MultiTech Electronics, Inc. Multimodem 224**
AT&T 212A/ 103-compatible	✓	✓	✓
Autodial protocol			
Hayes AT	✓	✓	✓
V.25/V.25bis	✓		
Autodial facilities			
Numbers stored	9	1	10
Retries	9	0	Unlimited
Alternate number redialing	✓		
Error correction	*	Optional	**

SOURCE: TMS CORP., DEVON, PA.

* Codex offers error correction with personal computer plug-in card version.

** MultiTech offers error correction in stand-alone and personal computer plug-in card versions.

Calendar

Sept. 8-9, Washington, D.C. — Managing Systems Projects. Contact: New York University School of Continuing Education, Seminar Center, 575 Madison Ave., New York, N.Y. 10022.

Sept. 8-10, Philadelphia — NCC-Telecommunications '86. Contact: American Federation of Information Processing Societies, 1899 Preston White Drive, Reston, Va. 22091.

Sept. 8-10, Chicago — Telecommunications Management. Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

Sept. 8-10, Washington, D.C. — Packet Tech '86. Contact: Telestrategies, Inc., 1355 Beverly Road, McLean, Va. 22101.

Sept. 8-12, Tulsa, Okla. — CICS/VS Command Level Programming. Also, Sept 8-12, Chicago. Contact: Computer Assistance, Inc., Education Services, Suite 108, 11498 Luna Road, Dallas, Texas 75234.

Sept. 9, Arlington, Va. — Achieving Excellence: How to Implement the New Excellence-Oriented Management Style in Your Department or Company. Also, Sept. 10, Charlottesville, Va.; Sept. 11, Richmond, Va. Contact: Careertrack Seminars, 1800 38th St., Boulder, Colo. 80301.

Sept. 9-11, Atlanta — Intelligent Buildings Conference and Exposition. Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

Sept. 9-11, Las Vegas, Nev. — Eighth Annual Satellite Communications Users Conference. Contact: Satellite Communications, 6530 S. Yosemite St., Englewood, Colo. 80111.

Sept. 9-12, Minneapolis — Data Communications: Components, Systems and Networks. Contact: Institute for Advanced Technology, 6003 Executive Blvd., Rockville, Md. 20852.

Sept. 10-11, San Francisco — Introduction to Fiber-Optic Communications Systems. Also, Sept. 24-25, Chicago. Contact: Hinckley Communications, 14 Parker Road, Osterville, Mass. 02655.

Sept. 10-11, San Francisco — Timeplex T-1 Seminar. Contact: Timeplex, Inc., 400 Chestnut Ridge Road, Woodcliff, N.J. 07675.

Sept. 10-12, San Antonio, Texas — Data Communications. Also, Sept. 15-17, Boston. Contact: Center for Advanced Professional Education, Suite 110, 1820 E. Garry St., Santa Ana, Calif. 92705.

Sept. 11, Washington, D.C. — Strategic Planning and Information Systems. Contact: New York University, School of Continuing Education, Seminar Center, 575 Madison Ave., New York, N.Y. 10022.

Sept. 11-12, New York — New York University Local-Area Network Seminar. Contact: Administrative Management, Dept. N, 1123 Broadway, New York, N.Y. 10010.

Sept. 11-12, New York — Understanding ISDN. Contact: Telecommunications Research Associates, P.O. Box 1200, Newark, Ill. 60541.

Sept. 11-12, San Francisco — Token-Ring Network Applications Program Interfaces Seminar. Contact: Communications Solutions, Inc., 992 S. Saratoga-Sunnyvale Road, San Jose, Calif. 95129

Sept. 11-13, Tampa, Fla. — Tampa Computer & Business Equipment Showcase. Contact: The Interface Group, Inc., 300 First Ave., Needham, Mass. 02194.

Sept. 15-19, Vienna, Va.— MICS Installation Course. Also, Oct. 20-24, Vienna, Va. Contact: Morino Associates, Inc., 8615 Westwood Center Drive, Vienna, Va. 22180-2215.

Sept. 16, Fairfield, N.J. — Understanding Local-Area Networks and Computer Connectivity Issues. Contact: Andy Daino, Applitek Corp., 107 Audobon Road, Wakefield, Mass. 01880.

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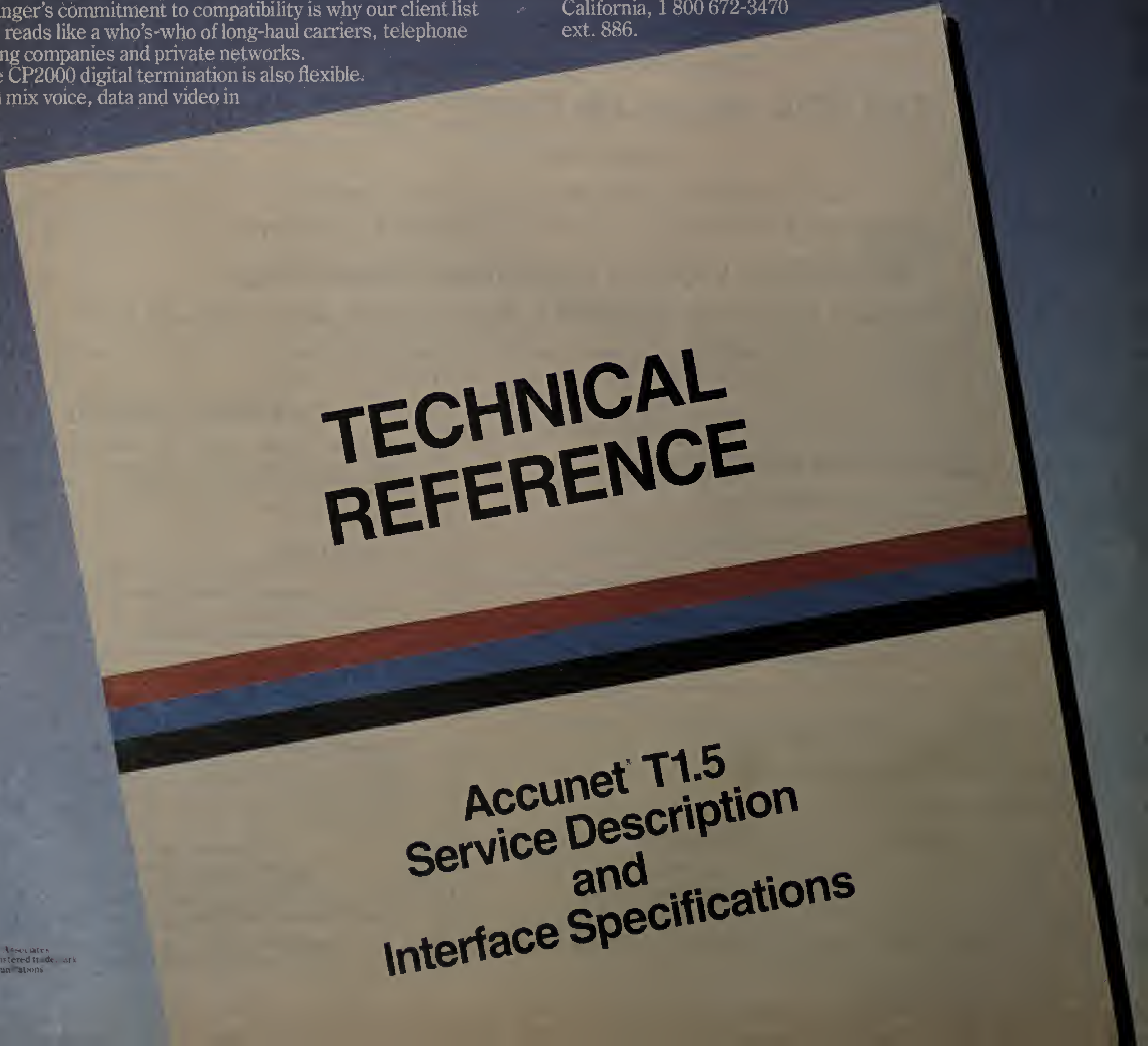

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